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TECHNOLOGY DEPARTMENT

AVIATION

The Oldest American Aeronautical Magazine

OCTOBER 13, 1928 Issued Weekly PRICE 20 CENTS

The new Pratt and Whitney powered Boeing transport over San Francisco

VOLUME XXV

NUMBER 16

Special Features

The Cleveland Airport

Aviation Country Clubs

The Control of the Materials

AVIATION PUBLISHING CORPORATION
250 WEST 57TH STREET, NEW YORK

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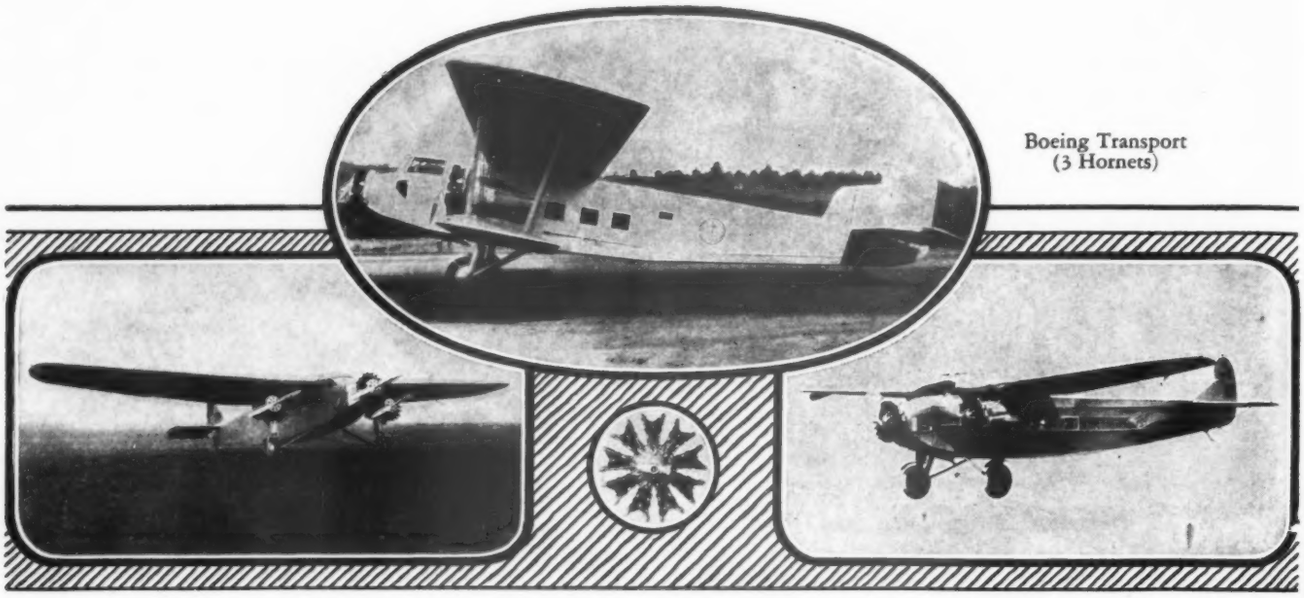


Boeing Transport
(3 Hornets)

Ford Tri-Motor (3 Wasps)

Fokker F-10 (3 Wasps)

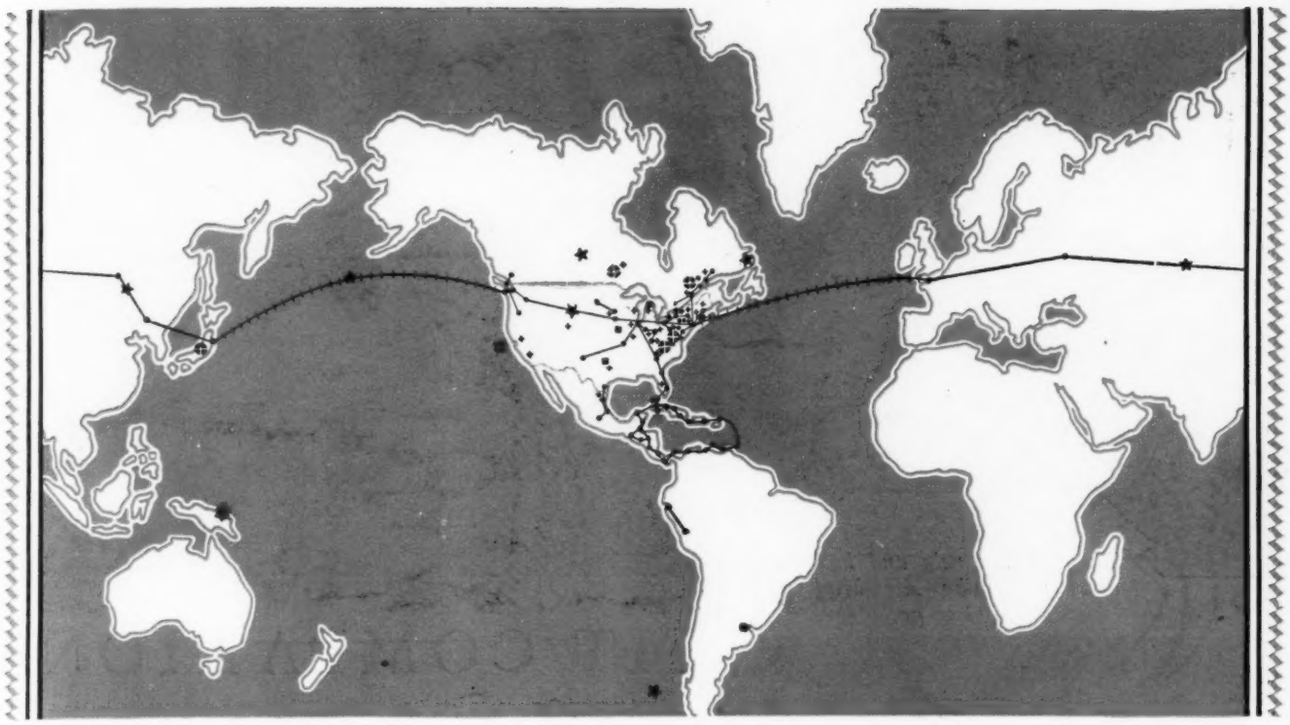
Solving The Passenger Transportation Problem

The latest products of the foremost designers and manufacturers of tri-motor ships are "Wasp" or "Hornet" equipped. The fact that all of these ships are capable of sustaining flight and even taking off with any two of their three "Wasp" or "Hornet" engines carrying a full pay load, marks a new era in passenger transportation. In these passenger transports the utmost in speed, comfort and safety is attained.

The inherent characteristics of the light but powerful Pratt & Whitney engines have made possible flying characteristics in tri-motor ships never before available. Coupled with the extreme dependability as proved by the millions of miles flown in commercial service, the performance of these ships as well as the factors of safety in flying have been marvellously increased.

THE
PRATT & WHITNEY AIRCRAFT CO.
HARTFORD CONNECTICUT

DEPENDABLE ENGINES



The World Over . . .

GOVERNMENTAL

United States Army
United States Navy
U.S. Department of Commerce
U.S. Department of Agriculture
Imperial Japanese Army
Department of National Defense, Canada
Royal Canadian Air Forces

INDUSTRIAL

Des Moines Register-Tribune, Des Moines, Iowa
Newspaper advertising, publicity and distribution

Wadhams Oil Company, Milwaukee, Wisconsin
Advertising and publicity

B.F.Goodrich Rubber Company, Akron, Ohio, *Transportation of executives, sales promotion advertising and publicity*

John Bailes & Son, Toronto, Canada, *Mining and mineral exploration*

Bell Telephone Company, New York, *Experimentation and research in aerial transmission and receiving*

The Aero Club of Tucuman, Buenos Aires, Argentine
Aeronautical education and aviation school purposes

Brock & Weymouth, Philadelphia, *Aerial surveys and photography*

Lloyd M. Long, Dallas, Texas
Aerial surveys and photography

TRANSPORT OPERATION

Colonial Air Transport, Inc.
New York–Hartford–Boston

Canadian Colonial Airways, Inc.
New York–Albany–Montreal

Colonial Western Airways, Inc.
Albany–Schenectady–Utica–Syracuse–Rochester–Buffalo–Cleveland

Clifford Ball, *Cleveland–Indianapolis–Cincinnati*

Pan-American Airways, Inc.
Key West – Havana – Santa Clara–Camaguey–Santiago de Cuba

Mid-Plane Sales & Transit Co., *Fargo – St. Paul*

West Indian Aerial Express, *San Juan–Santo Domingo–Port au Prince–Santiago de Cuba*

Western Canada Airways, Ltd.
Vancouver–Victoria–Seattle

Compania Mexicana de Aviacion, S.A., *Mexico City–Tampico – Tuxpan – Brownsville*

Pitcairn Aviation, Inc.
New Brunswick–Philadelphia – Washington – Richmond – Greensboro – Spartanburg – Atlanta

Canadian Transcontinental Airways, Ltd., *Grand Mere–Toronto – Montreal*

The Embry-Riddle Company
Chicago–Indianapolis–Cincinnati

Peruvian Airways, Inc.
Lima, Peru – Talara, Peru

TAXI SERVICE

American Aircraft Corporation, *Los Angeles, California*

Howard Brown, *Salt Lake City, Utah*

California Air Service, *Redlands, California*

Central New York Airways, Inc., *Norwich, N. Y.*

Campbell-DeSchepper Airplane Co., *Moline, Illinois*

Cardinal Flyers, Inc., *Louisville, Kentucky*

Chesapeake Aircraft Company, *Baltimore, Maryland*

Clyde Shockley, *Kokomo, Ind.*

Corporacion de Aviacion de Cuba, *Havana, Cuba*

Curtiss Flying Service, Inc. *Mineola, L. I., N. Y.*

Dennison Airport Corp., *Boston, Mass.*

Dungan-Smith Airways, Inc. *Cleveland, Ohio*

Fairchild Aviation Corporation, *Chicago, Ill.*

Ludington Exhibition Company, *Philadelphia, Pa.*

Merced-Wawona Air Lines, *Merced, California*

Michigan Air Transport Co., Inc., *Grand Rapids, Michigan*

United Air Lines, *Chicago, Ill.*

Pacific Coast Air Service, *Oakland, Cal.*

Wings, Inc., *Dearborn, Michigan*

Potomac Flying Service, *Washington, D. C.*

Weeks Aircraft Corporation, *Milwaukee, Wisconsin*

Rogers Air Lines, Inc., *Miami, Florida*

Scenic Airways, Inc., *Chicago, Illinois*

Western Canadian Airways, *Winnipeg, Canada*

EXPEDITIONARY

Byrd Antarctic Expedition to explore the reaches of the South Pole in the "Stars and Stripes."

Record globe-circling trip of John Henry Meers and C. B. D. Collyer — around the world in twenty-three days in the "City of New York."

United States Department of Agriculture "sugar" expedition over previously unexplored regions of New Guinea.

Geological surveys made by the Northern Aerial Minerals Expedition in otherwise inaccessible districts of Canada for the purpose of developing new mining resources.

Rescue expedition of the trans-Atlantic Bremen flyers at Greenly Island.

FAIRCHILD

Through the rain and hail and snow The Air Mail has got to go.

FIT COMPANIONS

For The Silent Courier of The Night

High and steady on his course the mail pilot speeds from New York to Atlanta . . . down the line to Philadelphia and Washington and over the hills of Virginia, the Carolinas to Georgia . . . his companions in flight the Pitcairn Super Mailwing and Naturaline the super aviation fuel.

Far below him, through the night, the old steam mail writhes ponderously amongst the hills, while the Super Mailwings pilot guides her on over rivers and forests, lakes and mountains, serenely confident in the unfailing performance of his ship, his Wright "Whirlwind" motor and "Naturaline" his fuel.

Naturaline is made entirely from natural gasoline and demonstrates a decided superiority in quick starting, fast pick-up, greater speed—20 to 25 per cent more power.

It has high volatility without gas lock, complete combustion and complete burning even at low temperatures, does not freeze the carburetor at high altitudes and WEIGHS 46 POUNDS PER 100 GALLONS LESS THAN DOMESTIC AVIATION FUEL.

Naturaline Company of America
CHESTNUT & SMITH BLDG., TULSA, OKLA.

PITCAIRN AVIATION INC.
LAND TITLE BUILDING
PHILADELPHIA PENNSYLVANIA

July 31, 1928

Mr. Fred L. Foster
Chestnut & Smith Corporation
Post Office Box 2003
Tulsa, Oklahoma

Dear Mr. Foster:

We have been using your Naturaline on our New York-Atlanta airmail line for several months and find it very satisfactory. We find that our motors run considerably smoother than they did on Domestic Aviation Gasoline and that they develop about 25 to 50 more revolutions. Also, our consumption is running a little less per hour.

I want to thank you for your assistance and co-operation in arranging a supply of gasoline in the various towns along our line. The directness of this distribution has made it possible for us to procure Naturaline at a very reasonable price.

Sincerely yours,

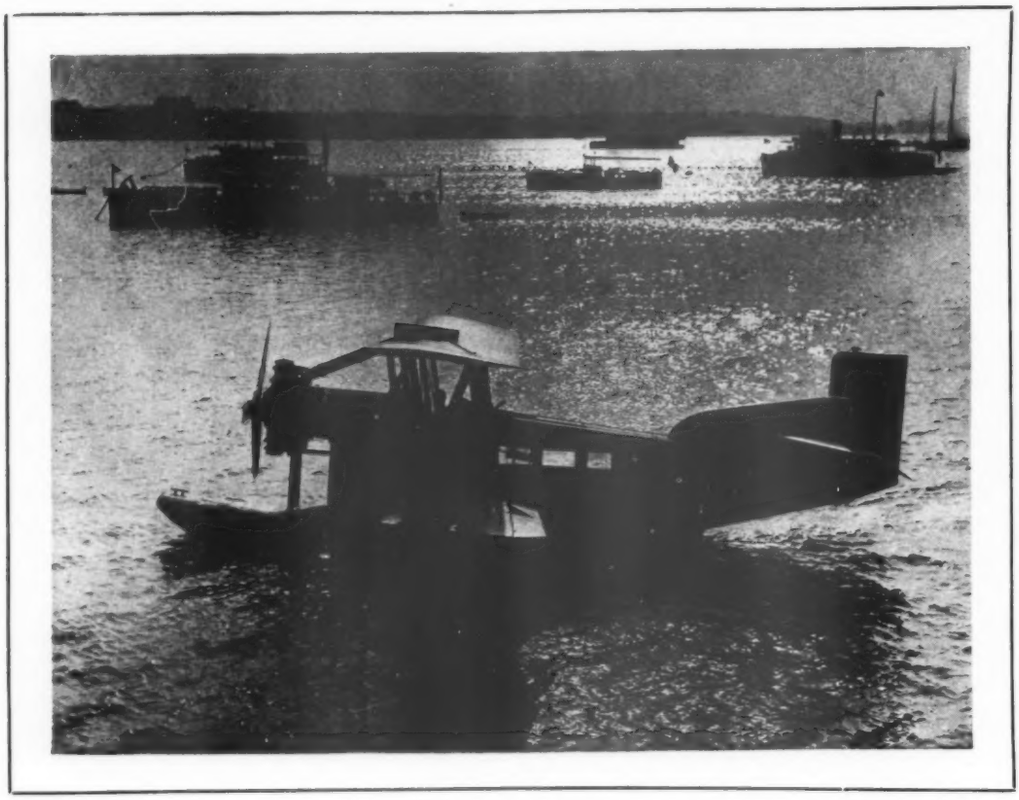
James G. Ray

JCR:L

James G. Ray

JIMMIE RAY

Chief of operations for Pitcairn Aviation, Inc., smiles his appreciation of Naturaline



AMERICA'S PROVEN AMPHIBIAN

Now Available for the Commercial Market

Loening Cabin Amphabian with Pratt & Whitney 425 *h.p. "Wasp air cooled engine. U. S. Dept. of Commerce Approved Type Certificate No.* 34.

Loening Cabin Amphibian with Pratt & Whitney 500 *h.p. "Hornet" air cooled engine. U. S. Dept. of Commerce Approved Type Certificate No.* 66.

Loening Cabin Amphibian with Wright 500 *h.p. "Cyclone" air cooled engine. U. S. Dept. of Commerce Approved Type Certificate No.* 67.

Five years of specialization and intensive development have made the Loening Amphibian the most thoroughly tested machine of this type and it has proven itself in a great amount of diversified inland and over water uses, such as air transport, field hops, air mail, company freight, land surveys, air commuting, ship-to-shore, beach hopping, and air yachting.

LOENING AERONAUTICAL ENGINEERING CORPORATION
31ST STREET AND EAST RIVER, NEW YORK, N.Y.

THANK YOU *for mentioning* AVIATION

Perhaps YOU can qualify for an AMERICAN EAGLE sales franchise.....

***THE AMERICAN EAGLE** Sales Franchise presents the most unusual opportunity in the field of commercial aviation today. It offers these definite advantages:*

A LIBERAL SCALE **of discounts. There are no higher discounts paid by any recognized builder in America.**

A SALEABLE PRODUCT. **Safe, speedy, with never a structural failure, the American Eagle has conclusively proved itself the most popular plane in its class.**

THE CO-OPERATION **of a well-known and soundly established concern. American Eagle is the first company maintaining a road organization of men who have been trained to help the sales agencies in perfecting methods of merchandising and service.**

THIS FRANCHISE **offers more than any other sales contract in the industry. It is much sought after, but not hastily granted. Certain territories are still being held open to distributors and dealers who can prove their qualifications. Write to us.**

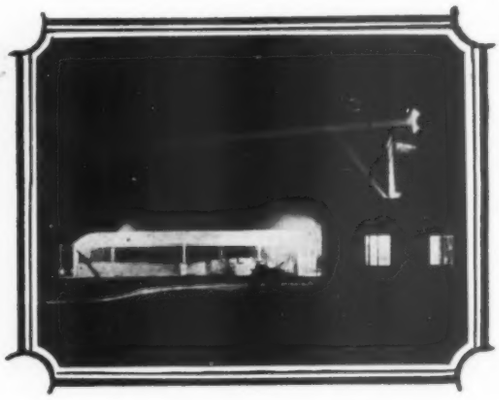
OX5, 90 H. P.	$2,985
HISSO—MODEL A	$3,500
HISSO—MODEL E	$3,850
RYAN SIEMENS, 97 H. P. . . .	$4,400
ANZANI, 120 H. P.	$4,600
RYAN SIEMENS, 125 H. P. . .	$5,825
SALMSON, 120 H. P.	$5,350

MASTER OF THE SKIES

AMERICAN EAGLE AIRCRAFT CORP. KANSAS CITY - MISSOURI

THANK YOU *for mentioning* AVIATION

A NEW 24-INCH REVOLVING BEACON



Type DCB24
Revolving Beacon

Crouse-Hinds
Type DCB24 Revolving Beacon

This new Revolving Beacon was designed by Crouse-Hinds Company to meet the requirements of U. S Department of Commerce and is the government standard for use on airways.

Zenith lights which use the spill light of the lamp enable an aviator to locate the beacon after passing out of the range of the main beam.

Before purchasing a Beacon, be sure to see the latest government standard.

"Everything in lighting equipment for Airports"

CROUSE-HINDS COMPANY

ESTABLISHED 1897

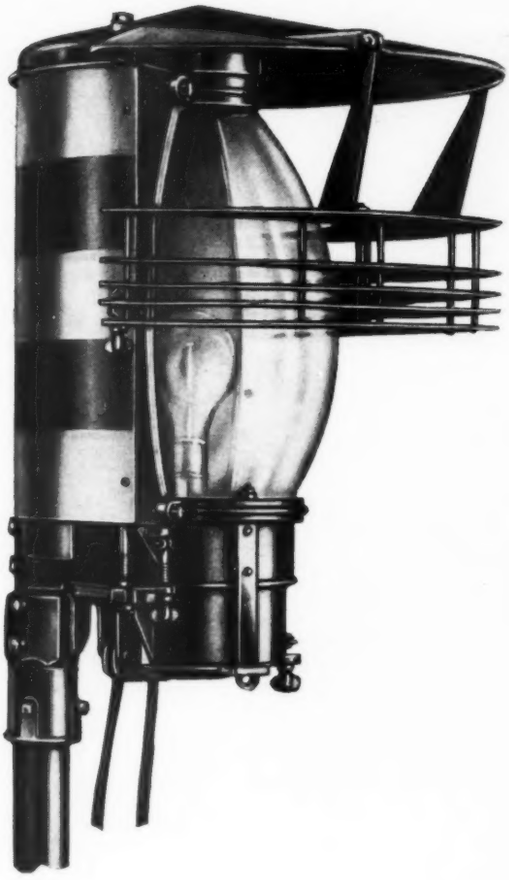
SYRACUSE, N. Y., U. S. A.

Sales Offices

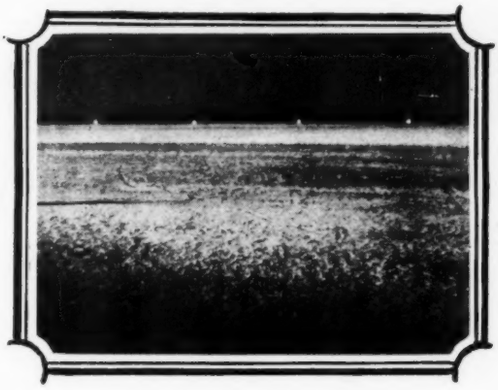
NEW YORK
PHILADELPHIA
PITTSBURGH
DETROIT
CINCINNATI
BOSTON
CLEVELAND
ATLANTA
CHICAGO
ST. LOUIS
SAN FRANCISCO
MINNEAPOLIS
MILWAUKEE

C-H387

A NEW 180-DEGREE AIRPORT PROJECTOR



Type AKP
Airport Projector



Crouse-Hinds
Type AKP Airport Projector

The last word in landing field illumination.

Entirely new in principle and design.

Designed for the distributed system of field lighting it gives perfect illumination without glare and provides absolute reliability.

Before lighting your field investigate the latest and best in Airport Projectors.

Let Crouse-Hinds Engineers design the most efficient lighting system for your Airport.

"Everything in lighting equipment for Airports"

CROUSE-HINDS COMPANY

ESTABLISHED 1897

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NEW YORK
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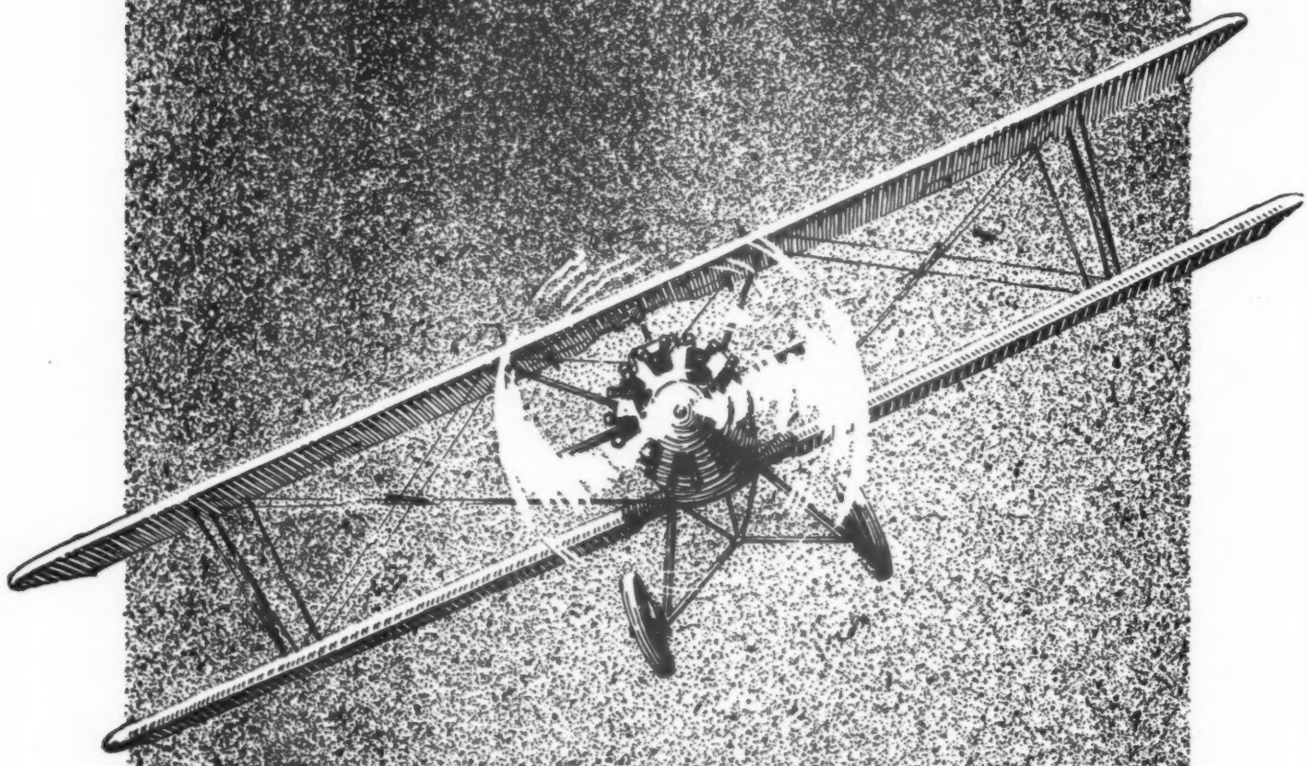
DETROIT
CINCINNATI
BOSTON
CLEVELAND
ATLANTA
CHICAGO
ST. LOUIS
SAN FRANCISCO
MINNEAPOLIS
MILWAUKEE

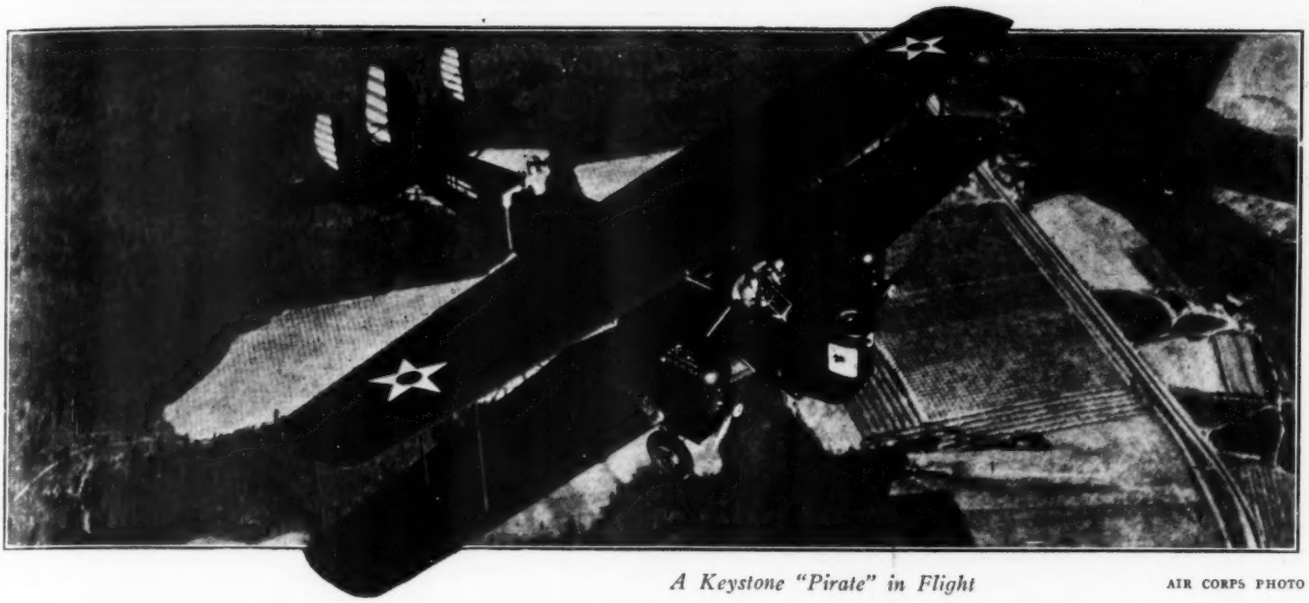
C-H388

The Consolidated Courier



Consolidated Aircraft Corporation
Buffalo, N.Y.

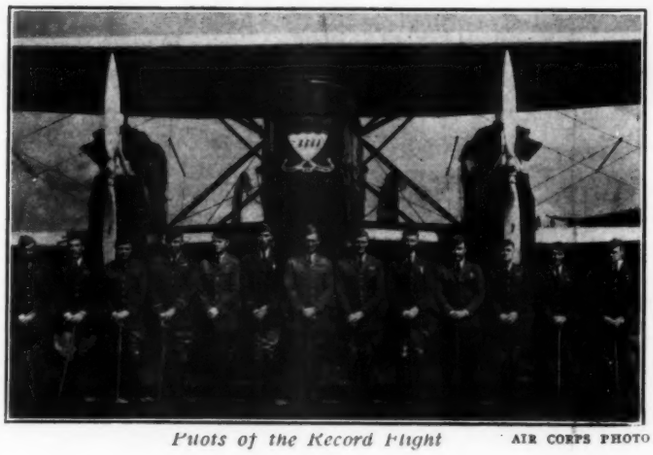
CONSOLIDATED AIRCRAFT



A Keystone "Pirate" in Flight AIR CORPS PHOTO

AN ACHIEVEMENT

THE RECORD FLIGHT of a formation of nine Keystone "Pirate" Bombers of the 2nd Bombardment Group—from Langley Field, Virginia, to Los Angeles and return, for the National Air Races—marks another milestone in the Progress of American Aviation.



Pilots of the Record Flight AIR CORPS PHOTO

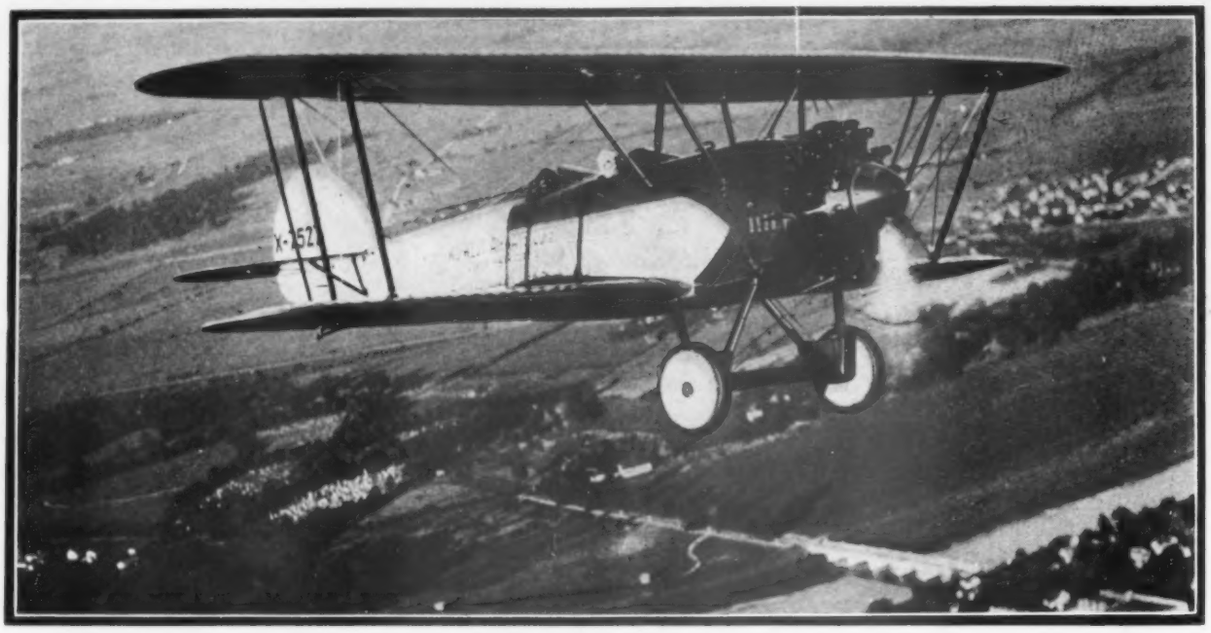
Successful accomplishment of a mission in which forty-five tons of tactical airplanes and thirty-six men were transported 6,000 miles, without mishap, over desert, mountain and plain—through all kinds of weather—is a tribute to the Air Corps.

The efficiency of personnel and equipment has been demonstrated once more in a way that accentuates the strides made in Military Training and Aeronautical Engineering.

The new Keystone "Panther" bomber—thirty-five of which are now under contract—represents another distinct advancement in Bombardment Equipment.

KEYSTONE

KEYSTONE AIRCRAFT CORP. BRISTOL, PENNSYLVANIA



Waco Wins Again

—TAKING FIRST PRIZES IN THE SEASONS MAJOR EVENTS

Winning Sweepstakes with best time from New York to Los Angeles.

Placing first in Transcontinental Air Derby, Whirlwind Class, New York and Los Angeles.

Winning the International Race from Windsor, Canada, to Los Angeles.

First in National Air Tour by a margin of nearly 3,000 points.

Again demonstrating the same quality of performance which in the last seven years has been responsible for Waco's leading position in the industry.

WACO AIRPLANES

The Advance Aircraft Co.

Troy, Ohio

THANK YOU *for mentioning* AVIATION

A STRENGTH TEST

REPORT ON TESTS MADE AT THE FACTORY OF THE ALEXANDER AIRCRAFT COMPANY FOR THE PURPOSE OF DETERMINING STRENGTH OF THE NEW CENTER SECTION EAGLEROCK

The first series of Eaglerock tests were made on the leading edge of the center wing section to determine the strength under the conditions of pulling out a dive.

A center section was used and was placed upside down and supported at the ends of the spars. A counter weight of steel track was placed over the rear spar to balance the leading edge load. Sand bags were placed over the leading edge. It withstood the equivalent of 13 factors for one and one-half minutes and therefore proved in excess of Department of Commerce requirements. A later test on a similar center section except for gas tank assembly showed the same results.

Tests were made on glue joints which showed the glue stronger than the wood.

In the wood tests the sample block was made in double shear to eliminate bending. Six tests were made on these blocks, some with glue joints and some without. The shearing values obtained were consistently higher than Grade A, specification required, one value as high as 1161 pounds per square inch being observed. The drier wood in this atmosphere accounts for the increase.

The latter tests did not give values for shearing strength of glue joints as the glue joints were at right angles to the plane of shear failure. They were tested in this manner to see if the laminated type of construction increased the effective shearing strength of the spruce. The test indicated that it did.

Two typical compression struts were tested and the actual fibre stress in the wood when loaded as a short column was found to exceed the required minimum by a safe margin. The first strut failed at 2915 pounds. Since the design load is less than 1400 pounds a considerable margin of safety results. The test of the second strut practically duplicated the first. The ends of these struts were considerably smaller than the cross section in the middle. The actual bearing stress was checked and found to exceed requirements with no sign of bearing failure.

To check the allowed modulus of rupture in static bending of the wood, a stock front beam was selected and the set up arranged so that the beam was loaded as a simple cantilever. Taking account of the form factor of the "I" section used, as determined by the Forest Products Laboratory, an actual fibre stress of 8450 pounds per square inch was developed as against a required stress of 5630 pounds per square inch.

Penetration of brazing on strut end fillings was tested. After checking brazing practice a sample test piece was tested. The strut end failed at 8501 pounds tension, while 3576 is the maximum design load.

The rib was tested in high and low incidence. The load factors supported were found to exceed those required. The original rib also supported a satisfactory load factor in medium incidence.

Ailerons taken from stock were sand loaded to the design load in order to test the strength of the aileron masts. The regularity of the aileron connecting tubes was similated. No damage was apparent, so the assembly was approved.

Eaglerock's superior strength assures safety and lasting dependability.

PRICES COMPLETE

Eaglerock holds Dept. of Comm. A.T. Certificates for motors Whirlwind J 5 and J 6, Hisso E and A, and Curtiss OX5 and OXX6.

Price of ship, less power plant and prop, is $2250, flyaway Colorado Springs.

List price of the Eaglerock flyaway Colorado Springs with center wing section gas tank, wobble pump, wood propeller and 30x5 DH wheels with the following motor is:

Whirlwind J-5 200 h.p. Government Overhauled $7500

Hisso "A", 150 h.p. 4000

ALEXANDER AIRCRAFT CO.

Dept. 401, Alexander Industries Bldg., Colorado Springs, Colo.

EAGLEROCK

THANK YOU *for mentioning* AVIATION

CARGO-SPACE *and* SPEED — The Pitcairn Super-Mailwing!

The combination of adequate cargo space and high cruising speed found in the new Pitcairn Super-Mailwing makes the ship the logical choice of air mail operators.

The mail compartment is 40 cu. ft. in size and can accommodate 500 lbs. of mail and express. It is entirely free from cross-members and wires, and its cover opens from either side of the fuselage.

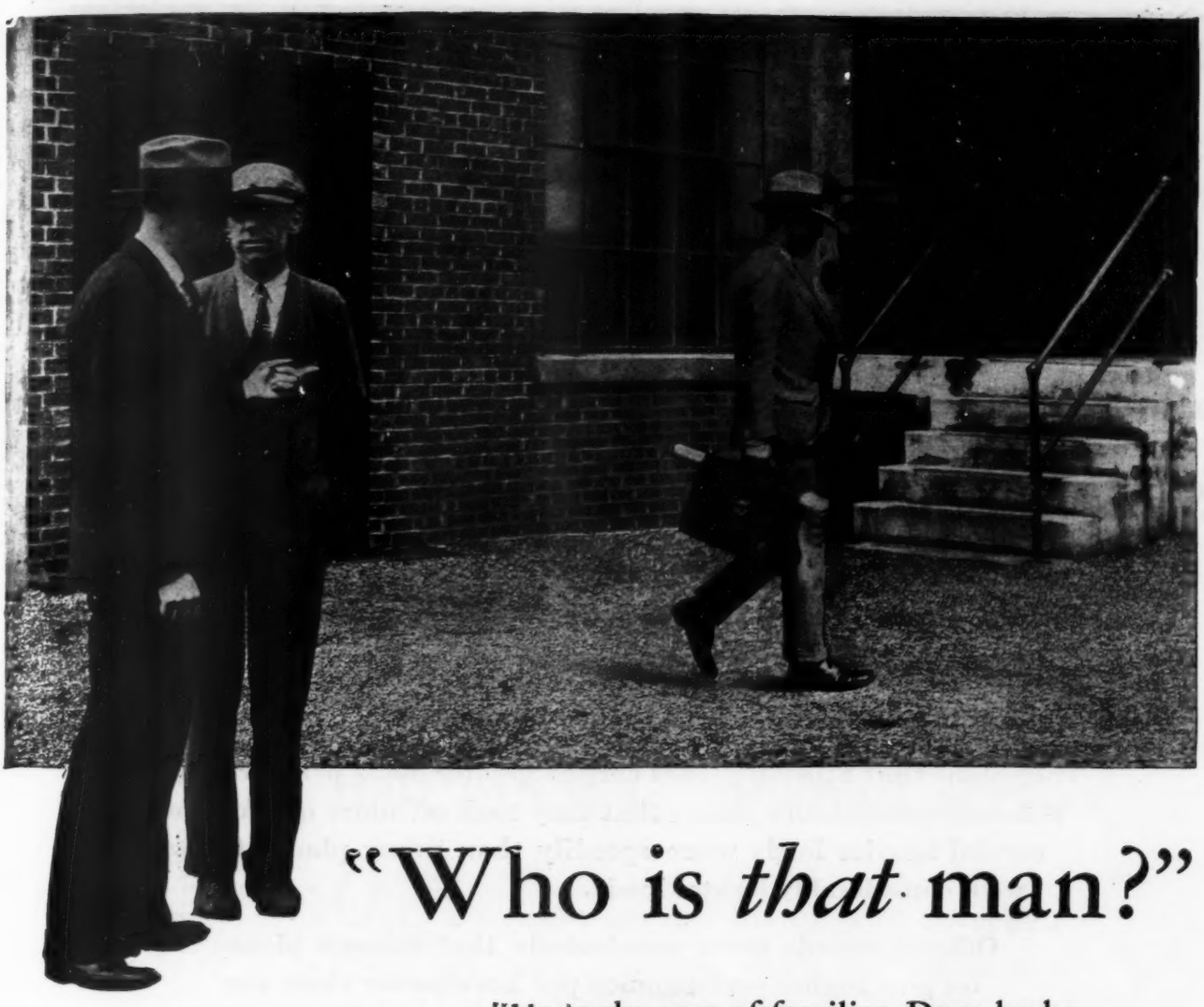
The pilot's cockpit is provided with an adjustable seat, which can be raised to increase visibility for landing or taking off.

The Pitcairn Super-Mailwing, completely equipped for night flying, and powered with Wright Whirlwind Engine, is priced at $11,500. We shall be pleased to submit complete specifications and performance data at your request.

PITCAIRN AIRCRAFT INC.

LAND TITLE BUILDING - - PHILADELPHIA

THANK YOU *for mentioning* AVIATION



"Who is *that* man?"

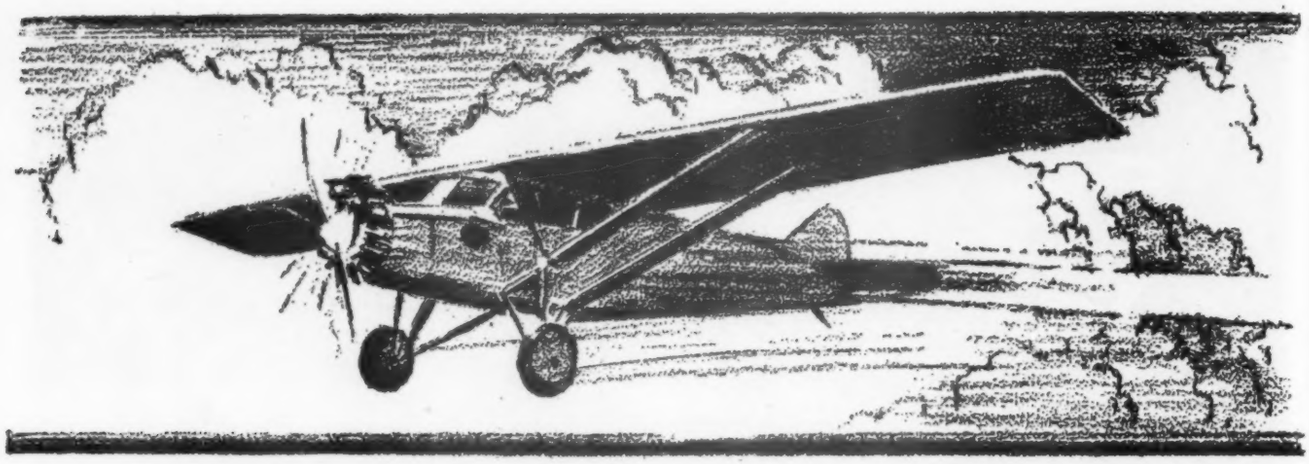
"He looks sort of familiar. Does he belong here?" asked the superintendent.

"He isn't on our payroll," replied the master mechanic, "but he sure gives us a lot of help with our welding. He's the Linde Service Supervisor. When we run into a tough job—like that new high pressure steam line, he's the man that shows us how to do it. Knows his business and ours where welding is concerned."

IF your job involves more than ordinary welding technique, the Linde Service Supervisor is at your call. He is part of Linde Process Service which is free to Linde customers.

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide UCC *and Carbon Corporation*
General Offices: Carbide and Carbon Building
30 East 42d Street, New York
54 PLANTS . 98 WAREHOUSES

LINDE OXYGEN



Stinson Superiority Proved by Official Records

To the prospective airplane owner, a close study of official results of the National Reliability Air Tour of 1928 reveals astounding facts.

They show, for instance, that Stinson Aircrafts finished *first* in their class —leading all other single Whirlwind cabin planes.

They show that Stinson planes carried greater loads per horsepower than any other cabin plane; that they took off more quickly and carried heavier loads more speedily than many planes flying with considerably lighter loads.

Official records prove conclusively that Stinson planes do give higher performance per horsepower than any other Whirlwind cabin plane.

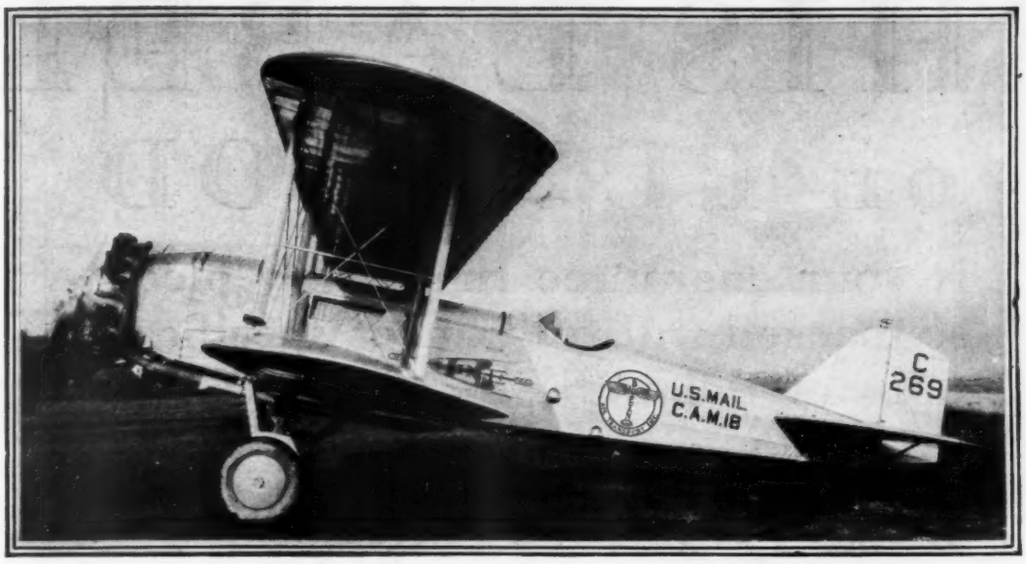
Cold facts reveal Stinson Superiority. And Stinsons have demonstrated this Superiority repeatedly — in all parts of the world — under all conditions.

STINSON
AIRCRAFT CORPORATION

Address all inquiries to General Offices and Factory at
NORTHVILLE, MICHIGAN

STINSON AIRCRAFT
"The Aircraft Standard of the World"
Manufactured By The Stinson Aircraft Corp. Detroit, Mich. U.S.A.

THANK YOU *for mentioning* AVIATION



BOEING

Proven by a million and a half miles of air-mail service

Over a million and a half miles of successful flying on daily schedule with the transcontinental air mail from San Francisco to Chicago, and return . . . under the most exacting airline conditions in America . . . is Boeing performance, of which we are justly proud.

With this enviable record behind the design pictured above, we offer it to the airline operator thoroughly and completely tested for dependable service.

Boeing Airplane Co.

Seattle, Washington

Mail by Air and Speed it There

BA88

THIS LABEL
on PLYWOOD

is your guarantee that every piece so marked will fully meet specifications of the U. S. Army and Navy.

CRESCENT PANEL CO. (INC.) LOUISVILLE KY.
WATER PROOF PLYWOOD
AQUATITE
TRADE MARK
INDIANA VENEER AND PANEL CO. (INC.) HOOSIER PANEL CO. (INC.)
NEW ALBANY IND

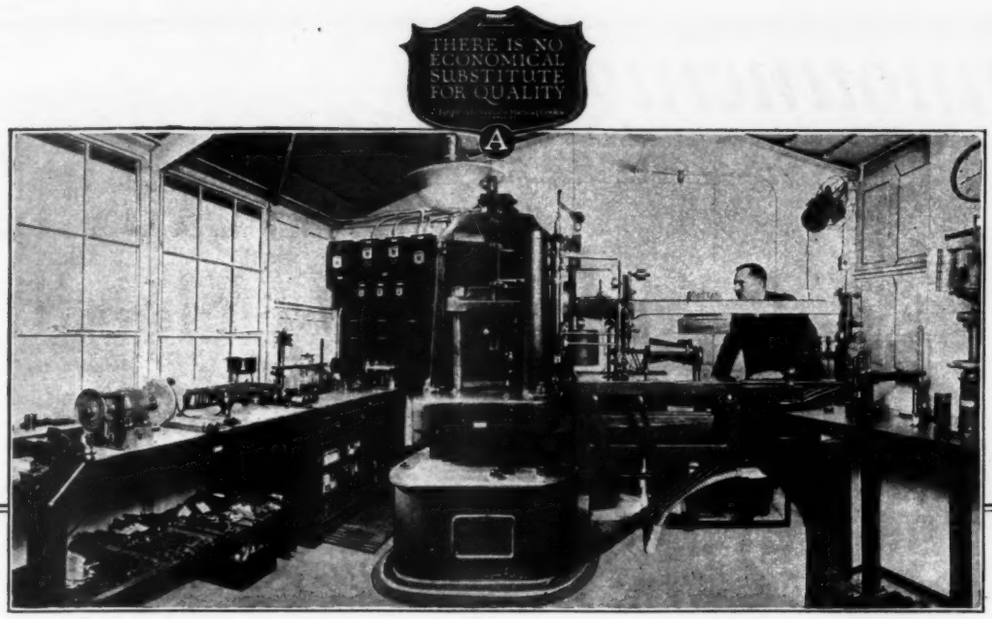
Adopted by the leading aircraft manufacturers of the U. S. Some of our customers follow:

U. S. Army
U. S. Navy
Ireland Aircraft, Inc.
Bellanca Aircraft Corp.
Pitcairn Aviation, Inc.
Wallace Aircraft Co.
Hamilton Aero Mfg. Co.
Arkansas Aircraft Corp.
International Aircraft Corp.
Stinson Aircraft Corp.
Swallow Airplane Mfg. Corp.
Alexander Industries
Stearman Aircraft Co.
B. F. Mahoney Aircraft Corp.
Cessna Aircraft Co.

JOBBERS

Nicholas-Beazley Airplane Co., Inc., Marshall, Mo.
Fessenden Hall, Philadelphia, Pa.
Johnson Airplane & Supply Co., Dayton, O.

CRESCENT PANEL COMPANY
LOUISVILLE, KENTUCKY



Scientific Research...

Stands Behind Axelson Dependability!

POWER PLANT dependability is often a question of the physical strength of metal.

When an emergency arises and your motor must deliver its maximum power ... when racing pistons are forced to share the tremendous force of almost constant compression with cylinder heads ... when connecting rods must take the full brunt of terrific power suddenly unleashed, the difference between successful flight and motor failure is metallic stamina.

Endurance strength of all metals used in the Axelson motor are predetermined in a fully equipped plant Laboratory. Materials must meet a definite static and dynamic physical specification. An analytical check for chemical elements is daily routine. Etch tests and microscopic examinations are invaluable as double checks for the soundness of material.

The characteristic response of various parts to specific heat treatments is checked by the use of the above pictured Laboratory equipment.

AXELSON MACHINE COMPANY

Airplane Motor Division

POST OFFICE BOX 337, LOS ANGELES, CALIFORNIA

The First of a Series of Advertisements Pertaining to Axelson Scientific Production

Announcing

NEW B. B. T. Auxiliary and dual purpose Floodlight

Low wattage lamp
Economical operation
Employs Fresnel hand-cut lens

Type T-8

This latest B. B. T. Airport Floodlight can be used as a supplementary light to be mounted on top of either the Air Mail Type M-8-D or Intermediate Air Mail Type H-8-D Landing Floodlights or used for temporary illumination prior to the requirement or installation of a major floodlighting system.

AS a preliminary installation, an airport is able to light a section of its field so that night landings may be made satisfactorily and later on employ this new unit as a part of a complete floodlighting installation.

The construction and principle of operation of this new Type T-8 Floodlight is the same as in the larger Air Mail Floodlights all of which employ the hand-cut Fresnel lens for the 180° distribution of light with a sharp cut-off at the top of the beam.

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A 2000 watt incandescent lamp employed as the light source means economy of operation and maintenance in addition to the low cost of the floodlight unit itself. Until you have actually seen or better still have landed by this floodlight no word explanation can adequately convey the intensity and area of the illumination produced.

Before installing any lighting equipment we cannot too strongly urge that you investigate this new dual purpose floodlight. Complete information will be gladly furnished together with catalog which should be in the hands of everyone interested in airport lighting equipment.

B.B.T. CORPORATION OF AMERICA

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AVIATION

The Oldest American Aeronautical Magazine

EARL D. OSBORN, *Publisher* — R. SIDNEY BOWEN, JR., *Editor*
GEORGE NEWBOLD, *Business Manager* — HERBERT F. POWELL, *News Editor*
ALBERT F. MULLADY, *Asst. Business Manager* — DAVID J. LEISK, *Art Editor*

Vol. XXV October 13, 1928 No. 16

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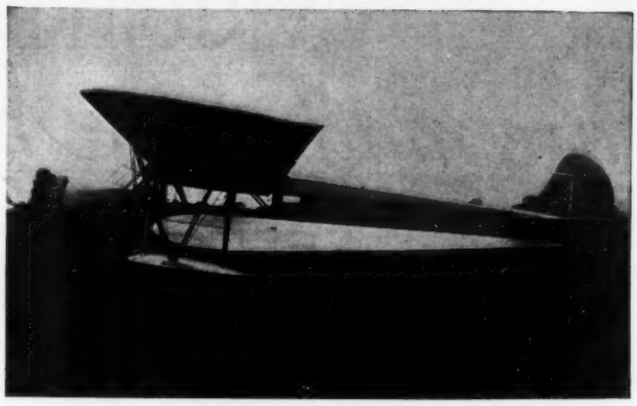
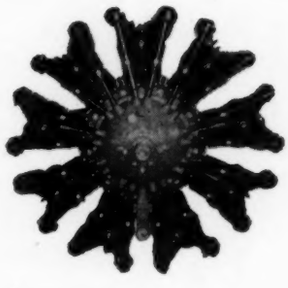


The Buhl Senior Airsedan powered with a 400 horsepower P & W "Wasp" Engine



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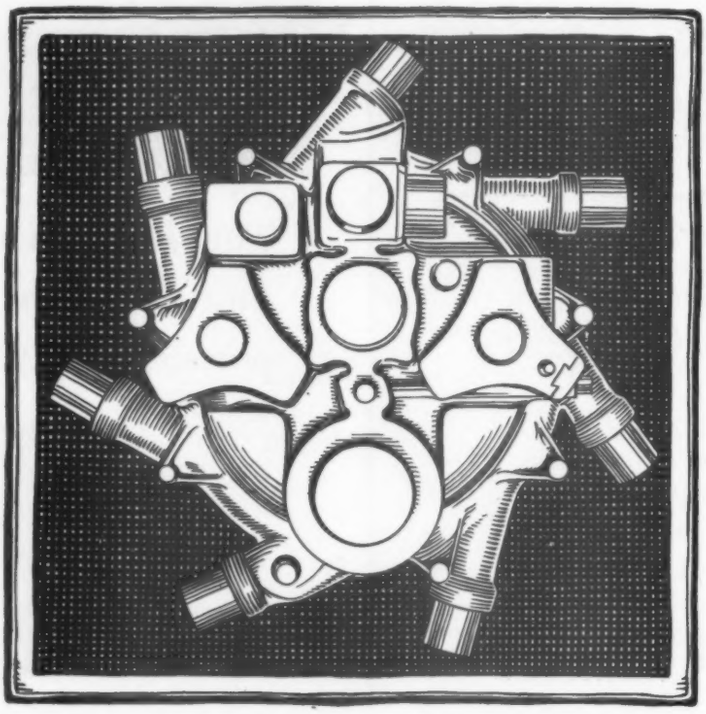

BEFORE engineering ideas represented by a blueprint can be reduced to tangible form—before the metals can be poured which give the engine its light weight and enduring strength—patterns for each casting must be carefully made. Patterns on which will depend the form of the casting—the accuracy of its weight and dimensions—the very success of the engine itself!

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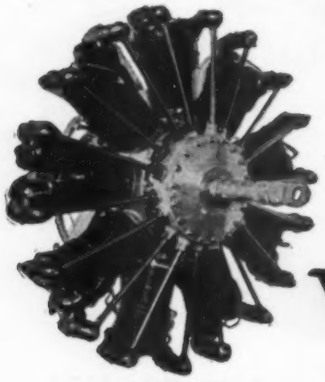

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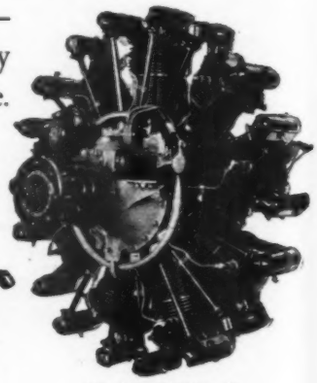

Wright "Whirlwind" Aeronautical Engine

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THANK YOU *for mentioning* AVIATION

AVIATION

The Oldest American Aeronautical Magazine

Vol. XXV OCTOBER 13, 1928 No. 16

The Worthy Type

THERE is, perhaps, no other industry in the world that has been made possible by such belief in a cause, and by such personal sacrifice, as the aeronautical industry. From the very beginning, the pioneers of the air were considered little less than crazy fools by the rest of the world, and it is only of recent years that they who laughed and ridiculed have come to realize what the time, patience, suffering and unceasing efforts of those "crazy fools" gave to modern civilization. More than once it seemed as though there was nothing ahead for those pioneers—that to carry on was but a waste of time and the throwing away of the best years of their lives. Yet, that great and eternal something inside of them, which, for the want of a truly suitable name must go nameless, inspired them to carry on in what seemed certain to be hopeless defeat of purpose. Those pioneering efforts are now history. History that has been forgotten by some, and never even known by others.

The realization of dreams come true will never be felt by all of those "inspired ones" for many of them have passed on to the airman's Valhalla—heroes of yesterday who gave their all that aviation might take its rightful place in the industries of the world. To them aviation owes a debt which can never be paid in full. Merely paid in part by continuing with the task to which they devoted their lives.

Naturally, there are men in the industry today who were not among the pioneers. They are the newcomers to the fold, but many of them also possess that priceless quality—faith in the cause. They believe in the airplane as they believe in nothing else and are working toward the common goal. Of late, a man had his entire family taken away from him by an airplane accident, yet in his hour of almost overwhelming grief his one desire was to redouble his efforts to make the air safe for others. To that end he is now working. Aviation was given birth by that type of man. Aviation is today being developed by that type of man and, God willing, the destinies of aviation will always be in the hands of such men.

War Fliers as Salesmen

IN the past year, airplanes practically have sold themselves. The demand has been far greater than the supply. As a result, there has been no need for maintaining well formed sales organizations. However, the production of aircraft in the United States is increasing by leaps and bounds, and soon there will be real competition in selling. Taking two products of equal value, the one, which is offered to the public through the most efficient sales system, undoubtedly will show the best results in sales.

There is the problem, though, in establishing a sales organization, of obtaining competent salesmen. The man, who sells airplanes, should have a knowledge of flying as well as salesmanship. During the World War, thousands of fliers were trained, and many of them have gone into sales work. It would seem that these men offer a fertile field from which salesmen and distributors could be recruited.

Without question, a large number of them could be shown that the sales end of commercial aviation now offers unparalleled opportunities. Although these men would of necessity have to "brush up" on the recent commercial developments, their war experience in flying would stand them in good stead.

Legal Precedents

THE law is one thing and the interpretation of the law is another. As yet there are no special laws applying to all phases of aircraft operation, and in almost all cases, it is necessary to go to laws, which have been drafted with a view to terrestrial affairs, and apply them to aerial operations. The judge who tries the case has, therefore, a double duty. He has to try to find out what law applies and then to interpret it. This is a difficult task and as a rule the judge will look up to see if there is any precedent in the case. If there is, the easiest matter is to follow the precedent. Once two or three cases have been decided in a similar way, a new interpretation, or the application of a law, becomes very difficult, and the precedent set by the original decision gains almost the force of a new law.

Many of the cases, which are being tried now, will set precedents that will last for many years. It is, therefore, highly important that the cases be correctly decided. Unfortunately, many of the cases, such as damage suits for accidents, are being tried in local courts where the judge is apt not to have had broad experience, and also, what is more important, the case is usually tried before a highly prejudiced jury. As a result, decisions, which might well be favorable to aircraft operators, have been adverse and precedents have been established which will do permanent injury.

At the present time, a damage suit arising from the operation of aircraft is a matter of national importance and should be so regarded, not only by the individual who is being sued, but by the whole aeronautical industry as well. The efforts of the Aeronautical Chamber of Commerce to find competent lawyers in various parts of the country who are conversant with aeronautical matters and who can handle cases with more authority than less experienced men are certainly efforts aimed in the right direction. There are many cases that should undoubtedly be appealed to the higher courts, which often would be beyond the means of some small local operator. In such cases, it would seem advisable for operators to pool together, and to employ the best possible talent in order to be sure that a correct precedent is established.

The Cleveland Airport

Continued Expansion and Improvement Since the Opening in 1925 Has Made the Field a Splendid Airport Model

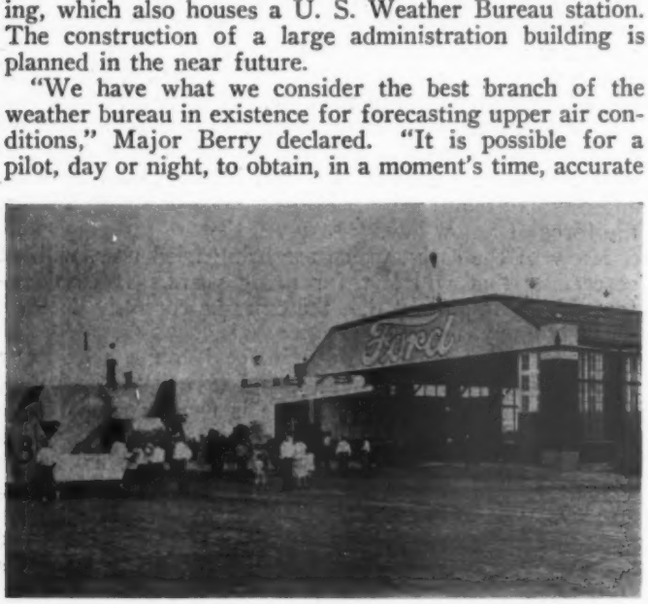
By WALTER E. BURTON

ITS rapid growth, since the opening July 1, 1925, has been an outstanding feature of the Cleveland Municipal Airport. Today, it is considered one of the finest examples of a modern air terminal. It is exerting an increasing influence upon transportation activities in Cleveland, and throughout northern Ohio.

The airport is situated on Rocky River road, about six miles from the Cleveland public square. When it was first opened, the ground area improved for use was approximately 400 x 2000 ft. The average number of plane movement each month was 300, not including short passengers sight-seeing flights. Today the improved field space measures 3500 ft. on a side, and the plane movements are totaling 1,500 monthly.

Eight large hangars, each capable of housing upwards of a dozen planes, are included among the airport buildings. Seven more hangars are to be erected this year, according to Maj. John Berry, superintendent of the airport. In addition, there is at present a small office building, which also houses a U. S. Weather Bureau station. The construction of a large administration building is planned in the near future.

"We have what we consider the best branch of the weather bureau in existence for forecasting upper air conditions," Major Berry declared. "It is possible for a pilot, day or night, to obtain, in a moment's time, accurate



Servicing a Ford tri-engined plane in front of the Ford hangar at the Cleveland airport, terminus of the Cleveland-Detroit line operated by Stout Air Services, Inc.

reports on weather conditions within a radius of 500 mi. of Cleveland."

The weather station is in charge of W. E. Jakl. Balloon soundings of the upper air currents are taken at periodic intervals throughout the day. Other weather information is collected by direct observation, and by reports from other stations.

Communication facilities at the airport, in addition to the usual telephone service, include telegraph lines and a radio station. A radio beacon, for the purpose of determining the position of planes in flight, is being installed.

The Cleveland airport also boasts of one of the best lighting systems, and one of the most complete drainage systems of any field in its class. A four-foot brick sewer, 7,600 ft. long; seven miles of 15 in. pipe, and 250,000 ft. of French drain pipe, insure a field free from mud holes and pools of water during all seasons of the year. The drainage system is being extended constantly.

Maj. John Berry, superintendent of the Cleveland Municipal Airport.

The nucleus of the lighting system is a 500,000,000 candle power floodlight. Besides this there is a 4,500 ampere, vari-colored beacon, a 5,000,000 candle power beacon, a ceiling light of the same power, and 60 boundary lights, each rated at 6.6 amperes, which outline the field.

Among the airlines now operating from the Cleveland airport are the Stewart Aircraft Co.; the Colonial Western Aircraft Co.; Pittsburgh, Youngstown and Cleveland Air Mail Line; Continental Airways; United Air Lines; two lines of the National Air Transport, Inc.; Stout Air Services, Inc.; Thompson Aeronautical Corp.; Young and Smith Airways; Dungan Airways, Inc., and the Ohio Airways Co. Most of these organizations maintain individual hangars. In addition, several new companies soon are expected to begin operations, Major Berry said. There is also a hangar of the Ohio National Guard Aero Squadron on the field, where a fleet of military planes is maintained.

The Stout Air Services, Inc., a division of the Ford Motor Co., operates perhaps the largest planes using the field. Regular service between Cleveland and Detroit is maintained with Ford three engined planes, carrying from six to 14 passengers. The trip, one way, takes one hour and 40 min. A speed of about 100 m.p.h is maintained. The present rates for the trip are $18 one way, and $35 for the round trip. Westbound planes leave Cleveland at

9:15 A. M. and 4:45 P. M. each day. They arrive at the Ford Airport in Detroit at 10:55 A. M. and 6:25 P. M., respectively. Eastbound planes leave Detroit at the same time the planes leave Cleveland, and arrive at the same hour that westbound machines land at the other end of the line. Each pasenger is permitted to carry 20 lb. of baggage without extra cost, but is charged 20 cents for each pound over that limit. Direct connections with hotels, at both ends of the line are provided by company-operated automobiles.

A delightful circle tour of Lake Erie, combining air and water travel, also is made. The route is covered by planes of the Stout line from Cleveland to Detroit; from Detroit to Buffalo, by steamers of the Detroit and Cleveland Navigation Co., and from Buffalo to Cleveland, by steamers of the Cleveland and Buffalo Transit Co. Time for sight-seeing in Detroit, and for an all-day visit to Niagara Falls is provided.

Conducts Sight-Seeing Trips

In addition to the inter-city service, the Stout Air Services conducts daily sight-seeing flights over Cleveland. A 25 mi. air trip over the city is made in Ford three engined monoplanes, such as are used on the Detroit-Cleveland line. The cost of the tour is five dollars a passenger. These flights are made every week-day between 1:00 and 4:00 P. M., and after 6:30 P. M. On Sundays, they are made from 10:00 A. M. until dark.

Another company, which offers a long tour at a comparatively low rate, is the Thompson Aeronautical Corp. The "Three-City" sight-seeing tour, featured by the organization, includes air visits to Cleveland, Elyria and Lorain. The trip is 55 mi. long, and is made at an altitude of about 1,500 ft. Five-pasenger, Stinson-Detroiter cabin planes, powered with Wright "Whirlwinds," are used. The charge for the tour is but five dollars a passenger. From Cleveland to Lorain, the route follows the shore of Lake Erie, while the return is made inland.

The Thompson Aeronautical Corp. also offers a short "airdrome flight," gives aviation instruction, does aerial photography and advertising, and offers complete passenger service to any desired point.

Dungan Airways, Inc., offers a varied service. However, it gives special attention to its school for pilots. Its college of aviation offers approximately 60 hr. of class room instruction at its headquarters in the downtown section of Cleveland. Over 100 hr. of shop practice is given in the modern brick and steel hangar at the Cleveland airport, where there is space for housing from 12 to 14 planes. Because of the great number of planes at the Cleveland field, the students have an opportunity of studying in detail, practically all makes of planes now in use. Air instruction is given in dual control machines up to, and including, one hour of solo flying. Each student also plans for himself, and navigates a cross-country trip of 75 mi. without assistance from an instructor. Harold E. Dungan, ex-war pilot, is president and treasurer of the company, and is dean of the flying school. Other faculty members include Frederick L. Smith, flight commander and engineering officer of the Ohio National Guard Aero Squadron located at the airport; Joseph T. Bergeron, attorney and a lecturer on aeronautical law; Leon B. Lent, lecturer on airdrome management and commercial transportation; Edward R. Ballash, instructor in parachute operation and rigging; Dr. M. Luckiesh, director of the Lighting Research Laboratory of the National Lamp

Hangar of Dungan Airways, Inc., Ohio distributor of Fairchild planes and a dealer in Waco planes. The Fairchild cabin monoplane in the foreground was recently sold by the Corporation to the B. F. Goodrich Co.

Works of the General Electric Co. and an internationally known scientist, who is an instructor in meteorology, and Sydney S. Booth, registrar.

Other services provided by Dungan Airways, include hangar service for visiting planes; all kinds of shop work on planes and engines; airdrome flights and air taxi service; contract flying, and counsel on all problems pertaining to aviation. The organization also is Ohio distributor for Fairchild planes, and a dealer for Waco planes.

Flying service the whole year through, to practically any destination, is offered by the Thompson Aeronautical Corp. Trips to New York in three and one-half hours, Chicago in three hours, Detroit in one and one-half hours, and to Florida and California, in correspondingly short times, are included in regular service.

Thompson operated planes include Stinson cabin planes, Laird open cockpit planes and Swallow, Travel Air and Eaglerock planes with Curtiss OX-5 engines. These planes are used both for long flights, and for the short trips over Cleveland and vicinity. The rates for short flights in cabin planes are five dollars per passenger for 15 min. and for open-cockpit planes, three dollars per passenger for

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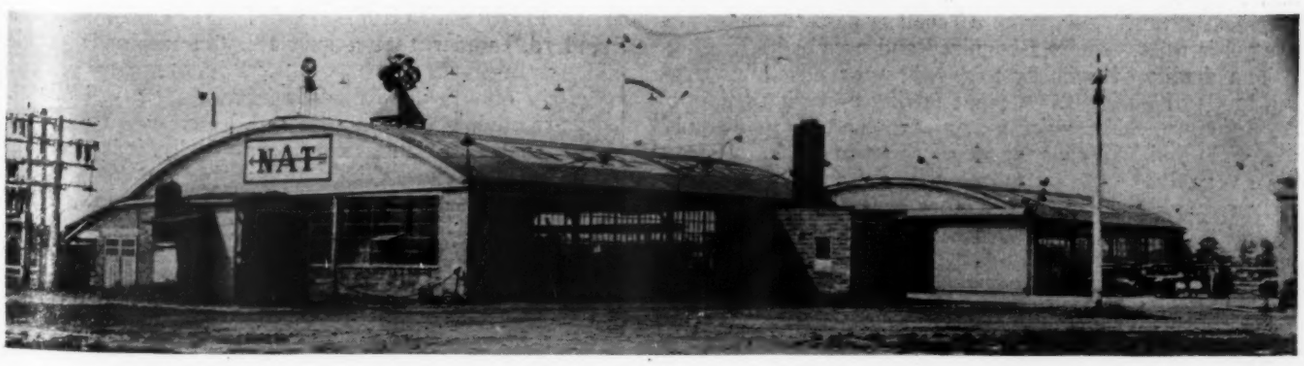

Two hangars of National Air Transport, Inc., at the Cleveland Municipal Airport.

The Control *of the* Materials

By EDWIN R. DOUGLAS
Consulting Engineer

IN several earlier articles, we have considered methods for controlling production by planning the labor. Obviously, there will be no use in advance planning of labor unless it is sure that the material will be at hand when wanted for that labor to work on. One way, not wholly uncommon, of attempting to ensure this, is to carry large stocks of everything conceivably necessary—a very poor policy for four good reasons: First, it ties up an excessive amount of capital; second, a great deal of storage space and shelving must be provided, and an undue amount of storeroom labor is required; third, a great deal of the material becomes obsolete before it is used; fourth, it does not accomplish what it sets out to do for—material shortages still occur.

There is another and better way, based on that exact knowledge which has formed the subject of these articles. It lays down two rules. The first rule is to carry as standard stores only those materials called for on the standard specifications, and a minimum list of others found necessary; to carry these in quantities dependent on the regular requirements and the length of time necessary to get deliveries, and to keep adequate and well checked stores records of every such article, showing quantities required, purchased, used, and on hand, with carefully considered minimums showing the points at which stock should be replenished by purchase, or manufacture.

Other Materials Purchased Specially

The second rule is that such other materials, as are from time to time required for special constructions, experimental developments, maintenance, etc., must be specially specified and purchased, but only in such quantities as are required for the work in sight. On receipt, they may be delivered directly to that work, or, if kept temporarily in the store room, are held there as a matter of convenience and certainty, marked for their particular jobs, and neither are recorded nor are considered as part of standard stores. The value of such systems of materials control is today widely recognized and accepted.

The details of such systems will vary with the varying kinds of business. A plant having a standard line of manufacture, will require a standard line of supplies and materials and will carry most of them in stock. It may have very little occasion to order special articles not regularly carried in stock. A factory which does a jobbing business, on the other hand, will purchase a great deal of its raw material specially for particular jobs and may carry very little standard stock. All of which indicates that the purchasing and stores system installed in any plant should be adapted to its requirements, not merely copied.

The airplane and engine building industries call for the carrying in stock of large quantities of small parts and materials. It is quite possible that, with further standardization, the number of these items may be considerably reduced, but this is not the whole story. Undoubtedly, the stock room shelves of most such plants would be found carrying many kinds and considerable quantities of articles now seldom used, or quite obsolete, as well as those which are in active demand. The reduction of such idle stocks is exceedingly important.

Must Control Special Buying

These industries also call for the frequent purchasing of new and special materials. This will continue, through the period of development and growth, probably for some time to come. This special purchasing must be so controlled as not to add to the volume of dead stock on the shelves, but cannot be done away with. In designing systems for these industries, we must, therefore, provide for both of these functions to a considerable degree. Although they interlock closely at certain points, the functions of purchasing and stock-keeping are quite distinct, and will be considered separately. It will be convenient to take up stockroom methods first.

If we make a tour of inspection through any plant in these lines we shall find materials in great variety, but classifiable under certain main heads, such as Sheet and Strip Metals; Bar Stock; Irregular Rolled Sections; Tubing; Wire and Cable; Bolts and Screws; Nuts, Washers; Nails, Tacks; Rivets, Pins, Cotters; Fabrics, Cords, Covering Materials; Paints, Varnishes, Lacquers, Oils, Lubricants, etc.; Pipe and Fittings, Millwright Supplies; Electrical Supplies; Instruments and Specialties; Lumber; Stationery and Miscellaneous Supplies.

Under each of these are a number of sub-classes which, in turn, may be further subdivided according to types, sizes, qualities, etc., until we come to the individual parts and articles. Thus, under the heading "Bolts and Screws," we have a class, "Cap Screws, Fine Thread, S. A. E. Standard," under that a subclass, "Hex Head;" under that, for instance, a size $\frac{5}{16}$ in. x 2 in., and finally, many materials, qualities and finishes, such as "Brass," "Steel," "Heat-treated," "Cadmium plated," etc.

To specify such an article unequivocally, it is necessary to designate all these things, thus:

Cap Screw, S.A.E. Fine Thread, Hex Head, $\frac{5}{16}$ x 2, Heat Treated No. 2330 Steel.

The designation is longer than the article. Here lies a source of confusion and error. If the designation be left to the draftsman who calls for it on the drawing, or to the mechanic who writes out a requisition, he will be apt either to leave out some of these details, or to call one of them by the wrong name. Thus, he may call it a

"bolt" or a "machine screw," which are quite different articles of different proportions, properties, and uses. This difficulty is met to greater or less degree in the case of almost every kind of part or material that may be required, or kept in stock.

"Calling a thing by its right name" is something that can't be done with any certainty. In such a store room, there will be several hundred classes and sub-classes of materials, each in from two or three to a hundred or more possible sizes, and with a hundred or so materials, qualities, and finishes represented. The total number of kinds of articles will run into many thousands. No one man is likely to know and remember the properties of more than a few of these classes. Hence the necessitiy for hand books, tables of standards, drawings of standard parts, etc.

But even when these standards have been provided it is necessary to tell which one is wanted, and to write its full designation on the drawings, specifications, and tickets. Such names, as in the example above, are long and cumbersome. They will be abbreviated, and how? Another opportunity for misunderstandings and mistakes!

The only way to be sure that parts called for and used will be the ones intended, is to give every standard part, or article, a definite number or symbol by which, rather than by its name, it may always be known and called for.

The problem is no small one to provide numbers or symbols to represent so extensive a list of kinds, varieties, and sizes. As in the case of drawing numbers and part numbers discussed in an earlier article, there are several plans which might be used. In the former case the consecutive plan and the classified plan were considered, and each was found to have certain advantages. Either might be used in the present case. In fact, the part numbers, of whatever type, will themselves be the stock numbers of all articles classified in the part number system. But there will be a great variety of materials not covered by that system, and these must be provided for. They are principally raw materials and standardized articles that can be bought in the open market, like sheets, tubes, bolts, screws, etc. These are sometimes termed "open materials."

For open materials the straight consecutive plan is not very well adapted. There are too many kinds and sizes to be covered. If numbered consecutively as they happen to come along, they would be all mixed up—a hodge-podge. To reserve certain hundreds for certain kinds and varieties calls for a great deal of advance planning, so that room enough will be provided for each, but not too much. It is merely a step toward the classified system.

Loose-Leaf Book Has Advantages

Another plan contemplates listing all these materials on pages of a loose-leaf book, a page to a kind, designating them by page and line number. The difficulties are partly, but not wholly removed. This is, however, a workable plan.

The best plan involves a thorough classification of materials, starting with headings similar to those listed at the beginning of this article, assigning numbers to the main heads, letters to the sub-classes and varieties, and numbers to the sizes. Thus, if in such a list, Bolts and screws of different sorts receive the numbers from 10 to 19, then Cap Screws S. A. E. Std. might be No. 13. If the types of cap screw be lettered, then Hex Head might be "H." If metals likewise be lettered and their varieties numbered, then Mild Steel No. 1020, Cadmium plated, might be designated "S 23." Then a Hex Head Cap Screw S. A. E. Std., 1020 Steel, Cadmium Plated, of any size, would receive the symbol, "13 HS 23," which is much less cumbersome than its name.

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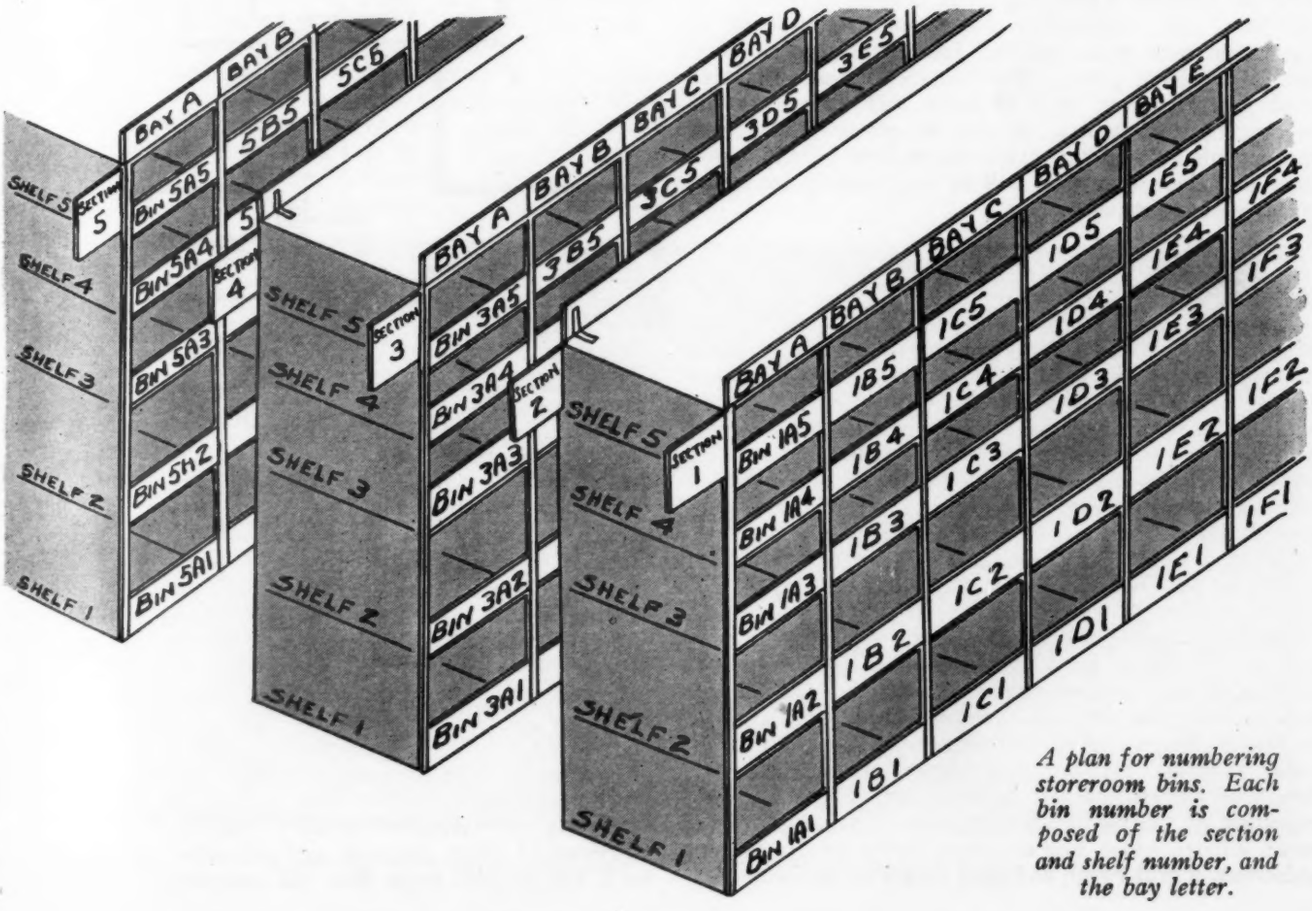


A plan for numbering storeroom bins. Each bin number is composed of the section and shelf number, and the bay letter.

Aviation Country Clubs

A Plan to Create a Nationwide Chain of Flying Clubs is Inaugurated With the Organization of a Long Island Unit

CONTRACTS for the erection of a clubhouse and hangars for a new flying club to be situated on Long Island, N. Y., will be let within the next few weeks. This club, which will be operated on a more elaborate scale than any of the existing American aviation clubs and will compare favorably with the best golf and yacht clubs of the country, is the first unit of what is expected to be a nationwide chain of flying clubs of the same type.

The Long Island club is the first "Aviation Country Club." It was formed by those living in and near New York who are members of Aviation Country Clubs, Inc., a non-profit organization incorporated under the laws of the State of New York to act as the parent body for the proposed chain of flying clubs. These clubs, according to the plan, will be located near the principal cities of the country and, it is expected, will do much toward popularizing aviation among those of the wealthier classes by providing a congenial atmosphere for their participation in flying as a sport.

A membership, sufficient for forming the first unit of the chain, was obtained in the three months in which Aviation Country Clubs, Inc., has been in existence. In that time, also, applications for forming other units of the organization were received from Westchester County, N. Y., New Jersey, Newport, R. I., and Philadelphia, Pa. However, it is probable that all efforts will be concentrated at first on the Westchester and New Jersey clubs. It is hoped by the backers of the movement that these two units will be in operation by spring or early summer.

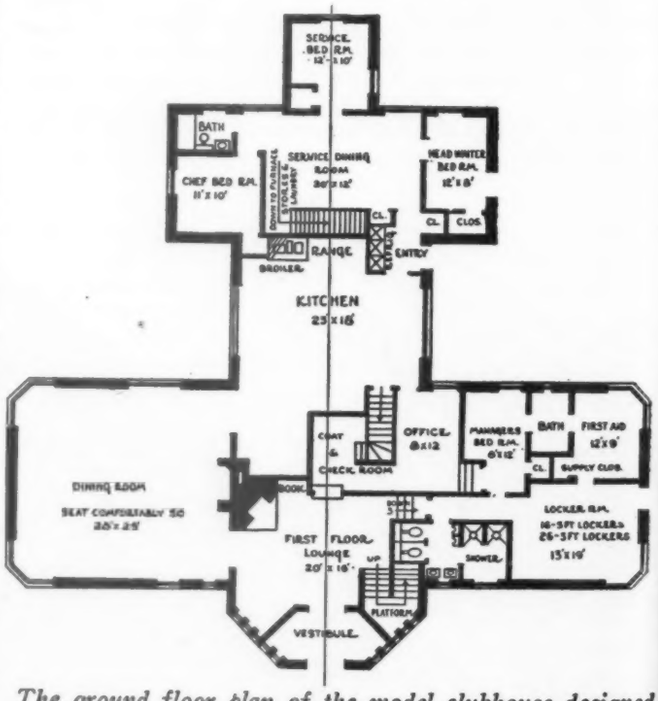
Each Club to Have Private Field

Each unit in the entire chain will have a private flying field with all the necessary equipment. There will be hangars, machine shops, and storerooms. Each will maintain a fleet of planes for the use of its members, and a regular course of instruction is to be provided for those who do not know how to fly. The planes will be used also to provide an aerial taxi service for members. Hangar space is to be furnished for the private planes owned by the members. Servicing of these and the club planes will be performed by expert mechanics in the employ of the club, just as the flight instruction will be conducted by pilot-employees.

While flying will be the center of activities, the social end of club life is not to be neglected. Each of the individual flying clubs will have its own clubhouse, which it is planned will compare favorably in size and furnishings with the structures now in use by some of the best country clubs. Dances, card parties, and other similar forms of amusement will be arranged. For the accommodation of the members, there will be a lounge, dining room, kitchen, office, first aid room, locker room, showers, bedrooms, a grill room, and card rooms in each club.

The relation of the national body to the individual clubs is much like that of the federal government of the United States to the various states. Each club will be a separate entity. It will select its own members, elect its own board of managers, and will control its own finances. At the same time, the affairs of the various clubs nationally will be under the general supervision and control of a National Advisory Committee, which is to be composed of the Board of Governors, elected by the entire membership, and a National Advisory Board, consisting of two members from each club.

Just as every voter is a citizen of the United States, so will those elected to membership by the individual flying clubs become members of Aviation Country Clubs, Inc.



The ground floor plan of the model clubhouse designed by Warren Shepard Matthews.

There will be no local memberships. All memberships granted will be in the national body; but the members will govern the affairs of the individual clubs with which they are affiliated, in a manner similar to the way in which the residents of a certain state govern the affairs of that state.

The reason for the adoption of this system by the organizers of the movement is explained clearly in a club brochure.

"Flying, by virtue of its very freedom from the restrictions of short distances and prescribed routes, takes on a far broader scope than the activities of the usual

social club—golf, tennis, or polo," the booklet says in part. "As an activity, it quickly becomes national and, by the same token, the formation of flying clubs logically must be considered from the national, rather than from the local viewpoint.

"Membership in Aviation Country Clubs carries full membership privileges in all the flying clubs formed. The advantages of such membership are self-evident. For the cost of one club, a member has exclusive club and expert flying field facilities, practically at cost, in all cities where an Aviation Country Club is organized. While an aviation club could be immensely entertaining as a unit of social life, it would, without direct association with similar clubs, somewhat identically constituted and located at strategic points throughout the United States, fall far short of the ideal.

Can Make Country Club Tour

"It will be but a short time before a member can make the 'Aviation Country Club Tour.' He can actually circle the United States in comfortable, easy 'hops' from club to club. He enjoys not merely the courtesies of each flying club, but actually a full and complete membership in every one. His itinerary planned, he finds himself at nightfall circling the hospitable field of an Aviation Country Club. His plane is serviced. He spends a pleasant evening at the club, where perhaps there is a dance. In any event, sleeping rooms, lounges, a locker room, showers and a restaurant await him.

"In a movement involving the formation of flying clubs throughout the country, the necessity for a central, representative national committee, is quite obvious. This committee, which will be known as the National Advisory Committee, will promote cohesion of thought and effort, assure a sound financial policy, keep a requisite degree of uniformity in the type and equipment of each club, and will bring to bear, on the problems of each, a collective knowledge, experience, and ability to purchase."

The new flying club movement is receiving the support of many prominently identified with the aircraft industry and others interested in the development of aviation. Aviation Country Clubs was incorporated by Sherman M. Fairchild, president of Fairchild Airplane Mfg. Corp.; Charles L. Lawrence, president of Wright Aeronautical Corp.; James B. Taylor, president of Air Associates, Inc.; George B. Post, president, Free Bottom Craft, Inc.; William A. Rockefeller, who is a director of several air transport lines; Robert Law, Jr., a director of the Murray Hill Trust Co., and Earl D. Osborn, publisher of AVIATION.

These seven men form the first Board of Governors of Aviation Country Clubs, Inc. An organization committee and a national membership committee have been formed for conducting the work of establishing the individual clubs. Miss Ruth Nichols, who made the first non-stop flight between New York and Miami, Darwin J. Adams, and John S. Reaves are members of the organization committee. Miss Estelle Manville, George

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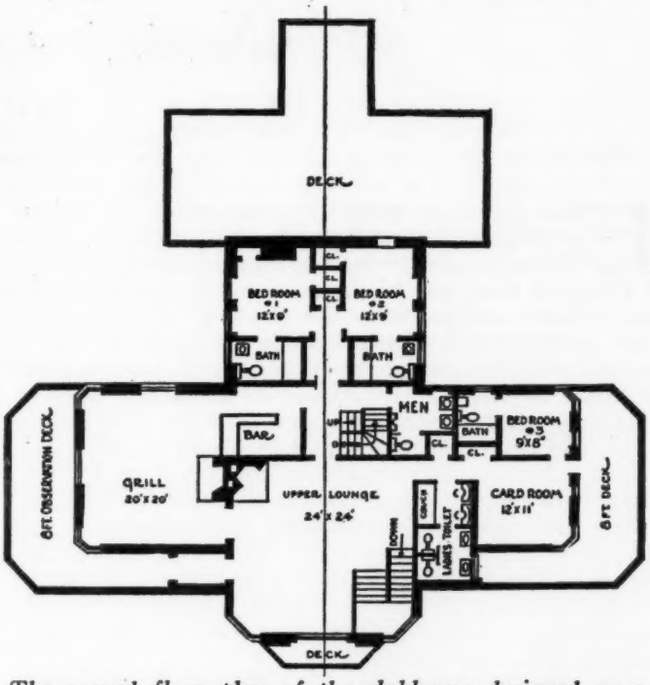


The second floor plan of the clubhouse designed as a model for the structures erected by the individual units of Aviation Country Clubs, Inc.

A reproduction of a painting showing how the club house of a typical Aviation Country Club will appear.

Merchandising Airplanes

A Discussion of the Methods of Distributing and Selling Aircraft and the Necessity for a Highly Organized System

By H. Lee
Secretary, American Aircraft Corp.
Los Angeles, Calif.

LIKE any other commodity, the airplane is subject to the general laws of merchandising. Each of the various plane manufacturers throughout the country is following some one of the usual methods of distribution. Some manufacturers sell direct to the consumer. This method usually is employed by those, who have not reached sufficient production to be able to take care of wholesale buyers. Others appoint direct factory dealers, who are really salesmen of the factory. They carry little or no stock on hand, either of planes or parts, but take orders from a demonstrator. Lastly, there are the manufacturers, who have perfected their factory methods so that they obtain a large enough production to permit the appointment of distributors with large territorial precincts, within which, they have protected selling rights. Under these distributors, there are dealers with definite selling territories, who in turn have salesmen to contact with the ultimate consumer.

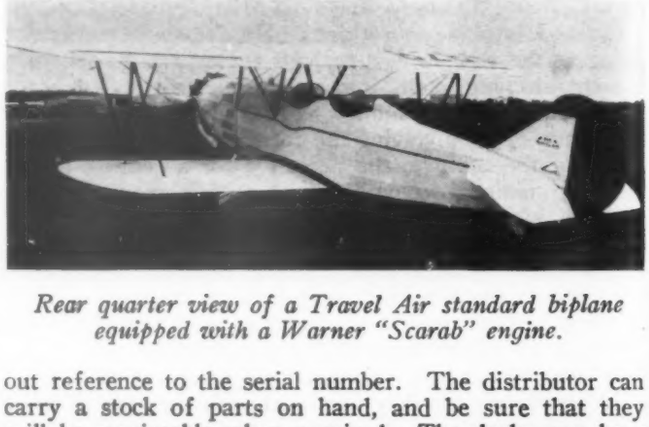
The manufacturer, employing either of the first two methods, usually runs into difficulties when he reaches the point where he must have a widespread sale of his product in order to keep ahead of production. In a case like this, as a rule, he finds that he has set his retail price too low to enable him to give the distributors an adequate margin of profit. The result is obvious.

At first glance, the latter plan may seem to be expensive and cumbersome. In reality, it offers the most economical method of obtaining widespread distribution. The factory contracts with its distributors for a definite number of planes a year in advance, and can arrange its purchasing and production schedules accordingly. The distributor knows what deliveries he may expect each month, for a year ahead. Through his dealer organization, he can dispose of his quota months in advance. Such a plan

Front quarter view of a Stinson Junior, powered with a Warner "Scarab" engine.

enables the manufacturer to use the best production methods possible, thus reducing factory costs. The distributor and dealer, by selling in large quantities, can reduce their selling costs, and so the consumer in the end is able to get better merchandise at the lowest price.

Hand in hand, with the selling of any mechanical product, goes the servicing of it after it has reached the consumer. Many a worth-while article has been a poor seller, simply because there was no one interested in seeing that the owner obtained the best possible results in its use. The "factory-distributor-dealer" plan of airplane selling insures a high standard of service. The factory, through quantity production methods, can have standard parts capable of being used on any one of its planes with-



Rear quarter view of a Travel Air standard biplane equipped with a Warner "Scarab" engine.

out reference to the serial number. The distributor can carry a stock of parts on hand, and be sure that they will be serviceable when required. The dealer can have his stock readily available for use as required and the owner can replace worn, or injured parts without delay.

The importance of this feature of merchandising airplanes was brought out noticeably when the National Air Tour reached Los Angeles. A well-known plane came to the field of the American Aircraft Corp. for servicing. The rudder and one of the ailerons was damaged to such an extent, that replacement was necessary. Although the plane had a special "paint job," the new parts were installed, and were painted to match. As a result, the pilot was able to leave on time. Another popular make of plane was delayed for several hours, because its tail skid shoe had worn out, and the local factory agent did not carry an adequate stock of parts.

Together with the merchandising plan, advertising campaigns are carried on by factory, distributors and dealers. Reaching the actual retail purchaser in selling airplanes is much the same as it is in other lines. Advertising brings in leads, which are followed up by personal calls of the salesmen. Students of flying become familiar with the planes on which they are trained, and form a fruitful field for retail sales. Buyers will come to the airport seeking information. Others must be sought out, "cold turkey," as the salesmen say. The successful retail airplane salesman will use a combination of these avenues of contact.

Two years ago, the average plane sold was the three-place open cockpit type. This plane could be equipped

(*Continued on page* 1210)

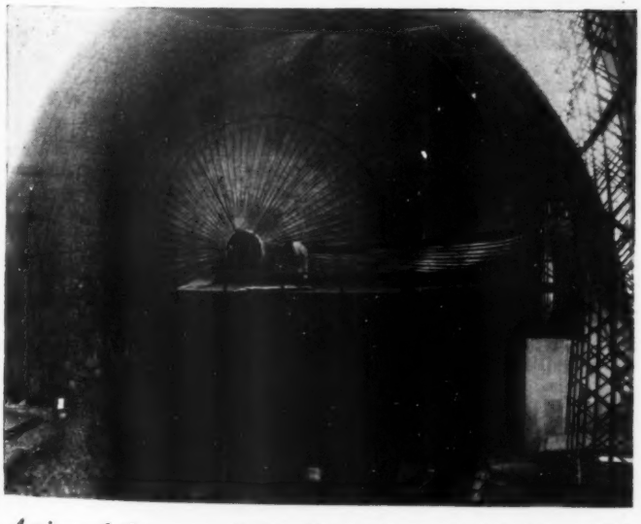
The Slate Dirigible

An Experimental All-Metal Airship With the "Egg-Shell" Type Hull Driven by a Steam Operated Blower in the Nose

THE short-hull, all-metal dirigible soon to be completed by the Slate Aircraft Corp., of Glendale, Calif., embodies several revolutionary departures from conventional lighter-than-air design, and construction. Thomas Benton Slate, who has developed a number of important inventions during the past 25 yr., is the designer of this unusual airship. Power for this interesting experiment about to be tested, is provided by steam turbines of entirely new and simple design; propulsion is accomplished by an ordinary straight blade centrifugal blower mounted in the nose of the ship, and fuel can be carried without detracting from the gross payload capacity.

The "egg shell," or double arch type of hull construction, eliminates the interior frame necessary in present types of dirigibles. The gas-tight metal cover acts as the gas container as well as the frame of the ship. In this construction the strength of the hull is built into the cover itself. The cover is corrugated longitudinally to give it rigidity and these corrugations are spaced and the hull held in shape by circular ribs placed at frequent intervals along the contour. Thus, a construction light in weight but very strong is attained, permitting the expansion and contraction of the metal without developing strains, and affording a fire and lightning proof gas container.

This first airship of the all-metal hull type is 212 ft. long and 58 ft. at the largest diameter. It has a total volume of 330,000 cu. ft. with a total lift of approximately 21,000 lb. and a payload of 7,000 lb., when using hydrogen as a lifting medium. More than thirty-three per cent. of its gross lift is used for payload.



A view of the nose of the Slate all-metal dirigible, which is nearing completion.

Steam power through turbins, gives a most dependable form of power that is relatively silent, and permits continuous operation day and night for over fifteen months. It is unaffected by climatic and temperature conditions and is used to heat the cabin when required. The one generating plant consisting of a high pressure, flash type boiler made up in two to four units, with condenser using but five gallons of distilled water to generate 500 lb.

The newly developed steam turbine adds considerable power while reducing the weight per horsepower to slightly over 3 lb. This includes all weights of boilers

Thomas B. Slate, designer and builder of the new all-metal dirigible.

turbins and gearing. The power plan is divided into seven units, there being that many turbins of varying sizes. One of 400 hp. is directly connected to the blower in nose of ship. Steam for this is piped to it from a boiler in the cabin. Two auxiliary power units are mounted, one on each side of forward end of cabin. These turbins will develop 40 hp. each and will be directly connected to an ordinary airplane propeller. These are primarily to offset the parasite resistance of the cabin structure to the slip stream. But the turbins are full reversable by merely injecting the steam from the opposite direction and these propellers can be used to stop the forward motion of airship or assist in turning and holding ship in position while it is loaded or unloaded of passengers and cargo. One small turbin of about 8 hp. is used to generate current for radio transmitting and to

(*Continued on page* 1208)

Development *of* Aircraft Propellers

By Lieut. Comdr. C. H. Havill, U. S. N.
Bureau of Aeronautics

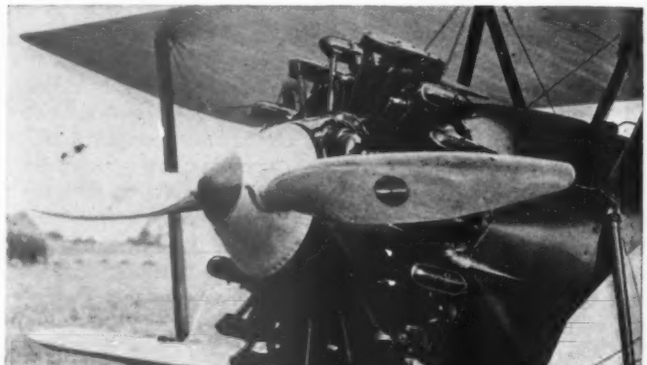
BEFORE the first successful flight of the Wright brothers in 1903, various mathematicians speculated on the proposition that an air propeller was analogous to marine propellers. There were two schools of thought at that time, one of which claimed that if proper corrections were made for the difference of density between air and water that marine practice in propeller design would apply equally well to air propellers; the other school of thought maintained that air being compressible, and having less density, and being subject to thermodynamic changes made it necessary that an entirely new theory of propeller design be produced. The air propeller first used by the Wright brothers in 1903 followed closely the marine theory but was modified to some extent to fit the then existing aerofoil theory. It was made of a light frame covered with canvas.

From this humble beginning the air propellers of the next six years were made largely on the system of trial and error. Meanwhile a Polish scientist named Drzewiecki was developing the theory that any one cross section of a propeller blade could be considered as an aerofoil section operating under certain conditions of air flow and that the summation of the effect of each section along the blade would give the total effect. On tests of various models it was found that his theory did not always fit the case, that there were still some unknown variables that entered into the performance. From consideration of these results an alternative propeller theory was put forward by R. E. Froude, famous for his research work on marine models in the towing basin in

A Hamilton metal propeller in use on a "Whirlwind" powered plane. The spinner completely hides the hub.

England. This theory assumes that the propeller is replaced by the equivalent to a special kind of disc moving at a velocity V relative to the air and having some device for imparting an acceleration to the air passing through the propeller disc. Then considering the mass of air being moved it was deduced that thrust equals rate of change of momentum. This alternative theory has been called the "momentum theory."

Thus, there existed in 1906, two logical theories explaining just how a propeller acts, the Drzewiecki or blade element theory and the momentum theory. In this connection credit is to be given to Mr. Lanchester for independently expounding the blade element theory in his "Aerodynamics" published in 1907, as Drzewiecki's work was not published until 1909. Further tests on actual propellers and models showed that neither of these



A view of the Standard Steel propeller used on a Waco 10 *powered with a Wright "Whirlwind" engine.*

theories exactly fitted the case, so an attempt was made to combine them so that theory would fit the test results.

In combining these theories it was found that both were fundamentally sound but that the assumptions on which each was based did not accord with actual conditions. It was found that the air acquired an increase of velocity ahead of the propeller which is known as the inflow velocity, that further the outflow velocity was not uniform over the propeller disc and that a certain rotational velocity was given to the slipstream. With these modifications of translational and rotational inflow velocities applied to the "Blade Element Theory," a method for designing an aircraft propeller was developed which is the one in use today. The problem of actual design, however, is not so simple as it appears, as experience and engineering judgment must be used to properly qualify the blade element method.

During the war a large amount of air propeller designing was done by trial and error. The method in use at that time was to design three or four wooden propellers for a particular new airplane and to put into quantity production the propeller which gave the best performance for that type of aircraft. The net results of these best propellers were analyzed, curves were plot-

(*Continued on page* 1206)

The "Kitty Hawk"

A Three Passenger Open Biplane Powered With a Ryan Siemens Engine Cruises at 90 M.P.H. and Lands at 40 M.P.H.

PRODUCTION is to be increased in the near future on the "Kitty Hawk" biplane, manufactured by the Bourdon Aircraft Corp., of Hillsgrove, R. I. The first unit of six planes has been completed and it has been found necessary to increase the rate in order to meet the demand. The Kitty Hawk is a three place, open cockpit biplane of conventional design, powered with a seven-cylinder Ryan Siemens radial air-cooled engine developing 96 hp. at 1750 r.p.m. Other power plants may be installed by a simple modification of the cowling and engine mount, which can easily and quickly be detached by the removal of several bolts.

Engineering work on the Kitty Hawk was started in November, 1927, by Allen P. Bourdon, designer of the plane. Structural designing and stress analysis were handled by F. T. Kurt and J. E. Summers of the engineering department of the Corporation. The first plane was test flown in May, 1928. The plane being designed for a radial engine permits of a concentration of weights near the center of gravity which contributes to the maneuverability. Variations in pay load cause only slight changes in the position of the center of gravity.

The Kitty Hawk has a wing span of 28 ft., an overall length of 21 ft. 11 in., and an overall height of 8 ft. 6½ in. The weight empty is 1,115 lb. and the gross weight 1,888 lb. It has a high speed of 112 m.p.h., a cruising speed of 90 m.p.h. and a landing speed of 40 m.p.h. The rate of climb is 600 ft. per min. and the cruising range is 500 mi. with a gasoline capacity of 37.5 gal.

In construction the plane conforms to new production practices, having wood wings and a fuselage of welded steel tubing. Instead of the usual chrome molybdenum steel in the fuselage structure, mild carbon 1025 is used because of its good welding characteristics. This practically eliminates any possibility of using stock of inferior quality for field repairs. The fuselage is of Pratt truss construction with a minimum of eccentricities at welded joints. Chrome molybdenum steel tubing is used for landing gear and tail skid.

The U. S. A. 27 airfoil section is used and the wings are of equal span and rectangular in plan form. Routed spruce spars and Warren truss ribs with glued and nailed plywood gussets are used in the wing structure. As in the case of the wings, ailerons are constructed of wood and covered with fabric. Both upper and lower wings have ailerons which are interchangeable and there is practically no gap between their leading edges and the surface of the wing where they are hinged. This is accomplished by a duralumin fairing on the wings and a cylindrical duralumin fairing on the back of each aileron. All covered wood and metal parts are Linoiled before covering. In-

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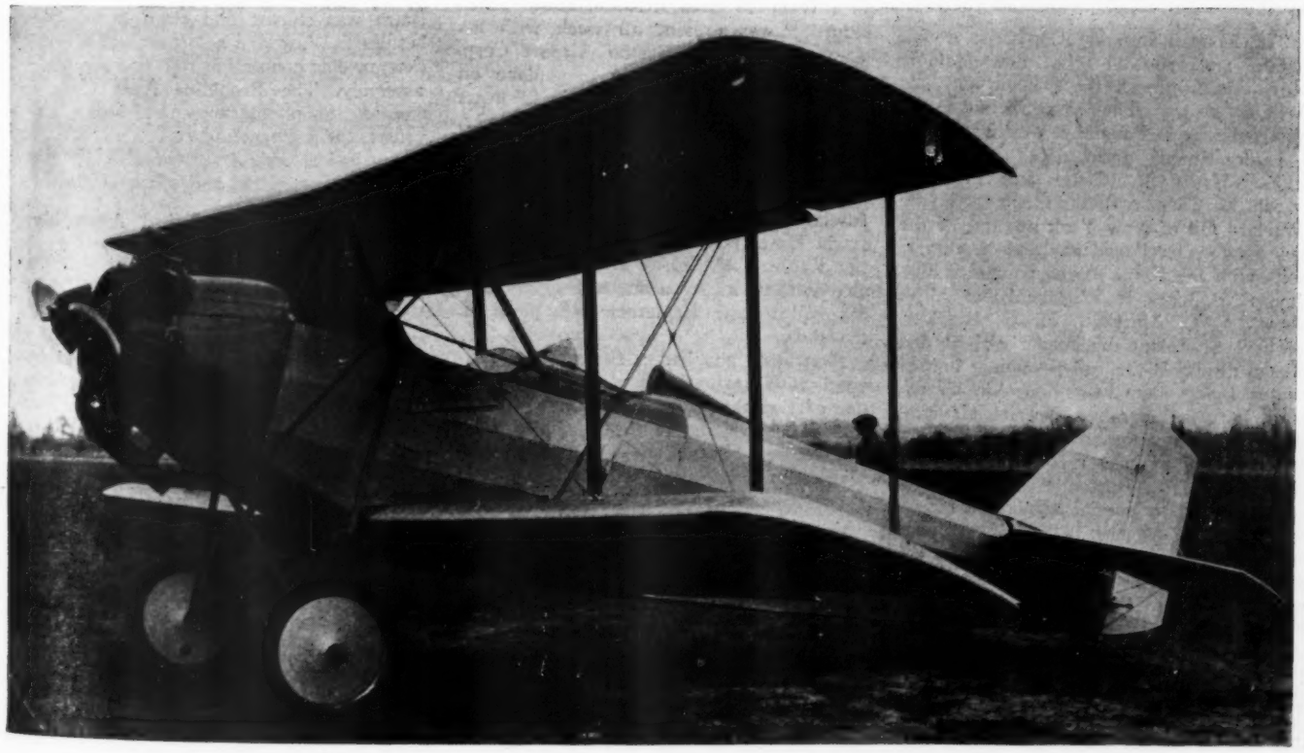


Front quarter view of the "Kitty Hawk" biplane equipped with a Ryan Siemens engine.

New England Aero Show At Boston Attracts 70,000

Manufacturers Find Many Sales Leads At Mechanics Building Exhibit

BOSTON, MASS.—The third New England Aviation Exposition held in Mechanics Building, Boston, October 1-6, attracted more than 70,000 attendance, resulted in numerous excellent leads for the sale of airplanes, showed the first of the new 110 hp. Siemens-Halske engines in a new Bourdon Kitty Hawk biplane, and accounted for the enrolling of numbers of flying students and the sale of many model airplanes and flying gear.

Without crippling flying activities at any of Boston's three active flying fields, 16 airplanes were in the hall. The show was the occasion for the consolidation of the American Airports Corp. of New England and Keniston, Inc., thus giving New England one of the strongest airport construction and maintenance firms in the country.

On entering the hall the Pratt & Whitney exhibit in charge of D. Christian Gauss faced the entrance. Behind it stood the Velie Monocoupe seaplane on its Edo floats. Stretching back through the hall were the other airplanes with the wall spaces given over to booths. Rand McNally occupied the first booth on the left. The new standard aviation map filled the back wall with smaller maps, a globe, the map used by Art Goebel on his record trans-America flight, and other interesting documents keeping Douglas Haight, George E. Seymour, and Grant Schlater busy answering questions.

Souvenirs Given Away

The Kendall Refining Co. had a double booth and showed the now famous board which graced the Detroit and Los Angeles shows. Their free helmets and pilot, engine, and plane log books caused a furore among local pilots and near-pilots. Harry R. Chase and his son, Harold M. Chase of Boston kept the booth. Standard Oil of New York had one of the new runway level field gas and oil service units with hand and engine pumps on display. C. B. Jones, R. W. MacMillan, A. V. Shaw, A. C. Marshall, H. G. Bigelow, and W. S. Folant officiated. Wright and Ditson displayed the full Spaulding line of winter flying suits. Colonial Air Transport, Inc., had arranged special air mail cancellations for the show and a different colored ink pad was used each day for philatelists. The Boston Evening Transcript prepared a special above the clouds souvenir card for the 10,000 air mail envelopes and these were mailed all over the country from the show. A Service Booth was a feature of this year's Boston show. Firms taking advantage of the cooperation given the industry included Carr Fastener Co. of Cambridge with their Dot Lubrication system, the Goodrich tire people, Westinghouse Micarta Propellers and airport lights, Paul K. Guillow airplane games, Harris oils, Iver Johnson flying togs, Ideal Clamp Co., Strauss and Bugeleisen, Atlantic Aircraft Corp. The show marked the first assembling of the new Massachusetts Institute of Technology Aeronautical Engineering Society training glider.

Kitty Hawk Plane Shown

The new Kitty Hawk had the place of honor among the airplanes, being the only modern New England produced plane.

A new Curtiss Robin was the only out-of-New England airplane in the show. Edward T. O'Toole flew a Waco 10 up from Martha's Vineyard for the show and decorated it with a sign, "This plane has flown 75,000 miles, three times around the world, and is still in good condition." Robertson Ayling entered his Challenger OX from Hyannis. Harold Dennison sent in a Waco 10 from Atlantic, Mass. Allen Bourdon was present all week with his Kitty Hawk. The Boston Airport Corp. showed a Fairchild cabin monoplane on wheels and beside it the Fairchild floats on which the plane operated this summer, as well as a new Travel Air OX.

Bay State Flying Service showed the gold painted American Eagle stripped fuselage which was at Los Angeles, a tiny Irwin Meteorplane, and a new OX American Eagle. Old Colony Airways was unable to show its Ryan due to charter work but had a new Eaglerock OX plane in the show.

Skyways, Inc., had a Stearman Whirlwind with navigation and landing lights, one of two they flew in the night formation which ushered in the show the night of October 1st, and the Monocoupe seaplane. Sumner Sewall entered his Monocoupe.

Display Early Type Plane

A plane built in Boston right after the war, the then famed Whittemore-Hamm with its five longeron membered body forward and monocoque type fuselage from the rear cockpit rearwards, was placed in the show by a group of flying club enthusiasts and served to emphasize the advance of the past 10 yr. in airplane design. Several of the pilots visiting the show had actually flown it years before.

The show was free from the Army and Navy planes which in past years have been relied upon to pad out the meagre commercial showing. The only service plane in the show was a De Haviland which the Boston Airport detachment had been waiting to demolish. It was sent over to give the youngsters something they could crawl around on without fear of damage.

Aside from the engines in the planes, a Le Rhone rotary of war-time vintage was mounted on a stand so it could be turned over by hand, a 150 hp. Hispano-Suiza was shown, and Pratt & Whitney, besides a Wasp and a Hornet had a crank case, master connecting rod, and a cylinder assembly. The Brookline Aero Club, in addition to photographs and other souvenirs, had a Zeppelin truss. The M. I. T. group had a wing from the 1925 Pulitzer Army racing plane, and a rib display.

Demonstrate Whirlwind Assembly

The maintenance department of the Boston Airport Corp. gave a Wright Whirlwind assembly demonstration. John and Walter O'Toole of the Beacon Air Service covered and doped a Pitcairn Mailwing wing at the show. Model planes and gliders were flown in the hall. Two model airplane contests for school boys, one for flying and one for scale models, were held. H. M. Murdoch, Fellow of the Royal Photographic Society of England, showed her large photographic collection, "Advancing Aviation." The First Corps of Cadets, a Boston National Guard anti-aircraft unit, gave searchlight demonstrations the opening night and then put two of their big lights in the hall beside their three inch anti-aircraft gun. The 101st Observation Squadron rolled their photographic laboratory truck in and operated it at the show. The R. O. T. C. detachment at Tech sent over photos, cut away bombs, and similar material.

Emsco Working On Aero Diesel

LOS ANGELES, CALIF.—Development of an aircraft Diesel engine has been started by the Emsco Aero Engine Co. of Los Angeles, according to the announcement of E. M. Smith, president. This concern has been incorporated for $500,000 and now plans to erect a $250,000 factory at one of the airports near Los Angeles.

Leigh M. Griffith, formerly identified with research work at Langley Field, has been named vice president and general manager of the new company. He stated that the new Diesel engine design showed exceptional promise and should be under production within the next eight months. The first engine will be of 1,000 hp., it is said.

Space at Chicago Show in Demand

Military Aspect to Be Lacking At International Aero Exposition

CHICAGO, ILL.—The tangible results of what American industry can accomplish without help of government subsidy will be shown December 1 to 9, at Chicago, when the Aeronautical Chamber of Commerce holds its first all-commercial International Aeronautical Exposition. It follows other shows of aircraft but will be the only one yet held with the military plane wholly lacking and given over exclusively to air transportation equipment.

The Aeronautical Chamber has leased the Coliseum and the First Regiment Armory, Chicago's largest exhibition halls. A canopied walk affords entrance from one building to the other, making the exposition practically under one roof. Though containing more than 100,000 sq. ft., requests of manufacturers of aircraft and accessories have reached the Chamber in such number that it is questionable if these two buildings will be sufficient in size to house the displays of all those who have made application.

Accessories to Be Separate

The available space has been allotted so that airplanes will be shown exclusively in the Main, North, and South Halls of the Coliseum and in the Armory. Accessory exhibits will be placed in the Coliseum Grand Ball Room and in the balcony.

The Chicago Municipal Airport will be available at all hours to those manufacturers wishing to keep planes in readiness for actual demonstrations. Those who will fly planes which will be put on exhibition will find cartage facilities ready at a minimum cost.

Chicago's official help has been assured by the active part the Mayor's Aero Commission and the Aviation Committee of the Association of Commerce are partaking in the plans.

Tibbs to Distribute Robin

OKLAHOMA CITY, OKLA.—Burrell Tibbs, conductor of the Tibbs Flying School here, has been named Central Oklahoma representative of the R. F. Garland Aviation Co., Tulsa, and will now distribute the Curtiss Robin in 15 counties. Tibbs is also an Eaglerock dealer.

Thompson Announces Promotions

CLEVELAND, O.—William H. Spire of the Cleveland plant of Thompson Products, Inc., has been named director of engineering and Richard E. Bissell chief engineer, it is announced by C. W. Miller, vice-president and general manager.

Lands in City

Showing the recent landing of the Ryan Siemens powered Goodyear baby dirigible Puritan on a building at Washington. John A. Boettner was at the controls.

Addition Is Completed To Stearman Factory

WICHITA, KAN.—The new unit of the Stearman factory here, providing 15,000 additional square feet of floor space, is ready for occupancy. The new unit is to be devoted to the building of larger and higher priced planes, most of which will be taken on special order, though built to specifications that will not interfere with the basic Stearman designs.

Three special planes with high powered engines for an air mail and passenger carrying concern in the East will be built almost immediately, Lloyd Stearman, president of the company, has indicated. They will cost in the neighborhood of $20,000 each and will be powered with Wasp or Hornet engines. The company already has started production of closed types.

Plan New T. A. T. Service

NEW YORK, N. Y.—Air passenger service with sleeping accommodations is to be started between Columbus, O., and West Coast cities, according to a statement made by C. M. Keys, president of Transcontinental Air Transport, Inc. This will be in addition to the regular plane-rail service being developed by T. A. T. No date for the new service has been set.

Chicago Club Holds Meet

CHICAGO, ILL.—Stunt flying, parachute jumping, balloon busting, bombing contests, and the regular air races were features of the Chicago Flying Club air meet held October 7, at the field at 8400 W. Irving Park Blvd.

Sikorsky Concern In Reorganization

New Firm Gives Commercial Sales Right to Curtiss Flying Service

NEW YORK, N. Y.—In order to increase production as well as bring about the formation of a new company to be known as the Sikorsky Aviation Corp., a readustment of the Sikorsky financial structure is announced here. More capital will be introduced, and the new company will acquire the assets and business of the Sikorsky Manufacturing Corp.

With this announcement came another that the new firm has entered into a contract giving the Curtiss Flying Service, Inc., exclusive rights for the sale of Sikorsky planes for commercial use in this country. A similar contract, furthermore, has been made with the Curtiss Aeroplane Export Corp. to care for foreign business.

"The introduction of new capital," according to A. C. Dickinson, President, "is chiefly for the purpose of increasing output. We are now producing one plane every 10 days. By the close of the year this will be increased to two planes a week, through doubling production capacity, and the schedule for 1929 calls for an output of 100 planes."

Stock in Three Groups

Under the new arrangement, the Sikorsky Aviation Corp. will have a capital of 200,000 shares of no par value. Of the total, 100,000 shares will be retained by the present management. The other 100,000 shares has been underwritten by G. M.-P. Murphy & Co., James C. Willson & Co., and the National Aviation Corp.

At the first official meeting of the new corporation an Executive Committee was elected and several new members were added to the Board. E. O. McDonnell, of G. M. P. Murphy & Co., is chairman of the executive committee. In addition to Mr. McDonnell, the board includes: James Bruce, vice president of National Park Bank; J. Cheever Cowdin, vice president of Blair & Co., Inc.; A. C. Dickinson, president of the company; Victor Drury; O. A. Glazebrook, Jr.; Henry G. Hotchkiss; Chas. S. "Casey" Jones; H. O. King; John Newell, Jr.; Joseph E. Otis, Jr.; Earle Hay Raynolds, Igor Sikorsky, vice-president and chief engineer; Andrew R. Smith; R. C. Stanley; H. E. Talbott, Jr.; B. Tompkins, vice president, Bankers Trust Co.; and James C. Willson.

Berlin Show Under Way

NEW YORK, N. Y.—Airplane manufacturers of 18 nations are being represented at the International Air Traffic Exhibition, which opened October 7 in Berlin, according to word received here.

Leaders in Aviation Gather At National Safety Meeting

Authorities Participate in Conference Sponsored by Guggenheim Fund

NEW YORK, N. Y.—Leaders in the aviation industry gathered October 4-5 at the First Aeronautical Safety Conference held at the Hotel Pennsylvania under the joint auspices of the Daniel Guggenheim Fund for the Promotion of Aeronautics and the National Safety Council. The meeting was held in conjunction with the Seventeenth Annual Safety Congress and was open to the public. A number of papers on the safety aspect of aviation were read by well known authorities on the subject during the two morning and two afternoon sessions of the conference which were well attended.

In considering the subject of aerial transportation and the factors contributing to its safety, Harry F. Guggenheim, head of the Foundation, selected several general topics for discussion. These included aircraft, airports and airways, medical aspects of aviation, the public and flying, passenger safety, flying and ground personnel. The subjects discussed on the first day of the conference included aircraft, structures and materials in regard to aviation safety; airports and airways; aids to navigation; Medical aspects and safety of airship operation.

Dirigibles Considered

A special section for consideration of safety in lighter-than-air craft was arranged in view of the growing interest in this form of air transportation. This was done in an effort to stimulate public confidence in dirigible balloon as a transportation medium. Among the speakers on this subject were Senator Hiram Bingham, of Connecticut, president of the National Aeronautic Association and Edward P. Warner, assistant secretary of the Navy for Aeronautics.

The feature of the program on the second day was a paper by Col. Charles A. Lindbergh on "The Requirements and Training for a Commercial Pilot," which he read before 1,500 persons. In his discussion he stated that there was a need for more complete training for students desiring to become pilots. A discussion of requirements, installation, field service and maintenance of aircraft engines was conducted by Charles L. Lawrence, president of the Wright Aeronautical Corp., and George Meade, chief engineer of the Pratt & Whitney Aircraft Co.

Technical Problems Stressed

Among the other subjects considered were the handicap of flying in bad weather; aviation instruments and their use in fog flying; and the technical safety problems related to the technical development of aircraft. Papers on these subjects were read by J. C. Hunsaker, of the Bell Telephone Laboratories; Lieut. Albert F. Hegenberger, U. S. A.; Prof. Alexander Klemin, of the Guggenheim School of Aeronautics, New York University; Thomas Carroll, chief test pilot National Advisory Committee for Aeronautics, and Ted Wright, chief engineer, Curtiss Aeroplane and Motor Co.

Wesley Smith, veteran National Air Transport mail pilot; Major John Berry, manager of the Cleveland Airport and Dr. L. H. Bauer, medical inspector of the Bureau of Aeronautics, were also among the speakers.

Many Airplanes Take Part in Meet at Albany

ALBANY, N. Y.—A large number of planes and pilots took part in the recent meet held at the Albany Airport under the auspices of Fliers Inc. The meet was officially opened October 3 and was to have been concluded October 6, but high winds and unfavorable weather conditions on October 5 necessitated postponement of the races scheduled for that day and resulted in extending the meet until October 7.

Several tri-engined Ford planes and the Fokker monoplane Friendship were among the visiting planes. A number of exhibition and passenger flights and several races were included in the events. On Saturday evening October 6 a dinner was given to visiting pilots and guests at the De Witt Clinton Hotel.

Graf Zeppelin Ready

NEW YORK, N. Y.—Radiograms received here from Friedrichshafen, Germany, state that final tests have been completed on the Graf Zeppelin and, as we go to press, Dr. Hugo Eckener is awaiting favorable weather reports before announcing the time of departure of the giant dirigible for the United States. Preparations are being made to receive the airship at Lakehurst, N. J.

Gets Business for Pioneer

BROOKLYN, N. Y.—Miss B. Davis, secretary of the Pioneer Instrument Co., this city, has recently brought new business to the company totaling $172,000.

Loud Speakers Used in Factory

COLORADO SPRINGS, COLO.—Officials of the Alexander Aircraft Corp. now call any one of the 450 employees in the new plant through 20 loud speakers placed at strategic points in the main factory and others in the smaller buildings adjacent. This arrangement enables reaching a man directly without the necessity of relaying a call in the usual manner from superintendent to foreman. If an officer wishes to speak with the foreman of the woodworking department, a call is put through on speakers in that section of the plant. In case the foreman is elsewhere in the factory, the call is sent out to all sections.

Many other advantages are found in the system. Officials address the employees without need of leaving their desks and without the necessity of the workers leaving their benches. The speakers are also used for sending music during noon hour and during overtime work periods.

Dinner to Day Given By Paterson Chamber

PATERSON, N. J.—A large gathering of persons prominent in the aeronautic industry and in civic and business life in Paterson recently attended a dinner at the Alexander Hamilton Hotel for Charles Healy Day, of the Gates-Day Aircraft Corp. The dinner was tendered by the Paterson Chamber of Commerce and constituted the official welcome of that organization to the Gates-Day company, which established its plant in Paterson several months ago.

Among the speakers besides Day were: The Hon. William P. MacCracken, Jr., assistant secretary of Commerce for Aeronautics; Ivan R. Gates, president of the Gates-Day Corporation; Rubin Reiffin, treasurer of the company; Guy Vaughan, vice-president Wright Aeronautical Corp.; James Wilson, president Paterson Chamber of Commerce, and Mayor Wilmer Cadmus of Paterson.

Orders 140 Propellers

TETERBORO AIRPORT, N. J.—What is said to be the largest single order for commercial airplane propellers was placed by the Fokker Aircraft Corp. when that concern purchased 140 steel two-and three-blade "props" from the Standard Steel Propeller Co. of West Hempstead, Pa. The propellers will be used on a number of Fokker monoplanes now being manufactured at the factories here, in Passaic, N. J., and Wheeling, W. Va.

A. C. of A. Firm Fully Organized

Board of Directors Is Elected For Company Replacing Pan American

NEW YORK, N. Y.—Final organization in New York of the Aviation Corporation of the Americas and the election of its first board of directors was announced this week. Through the new company, which is taking over Pan American Airways, Inc., operator of the first international mail and passenger service from the United States, North, Central, and South America will be linked by a single airway, bringing the West Indies and Panama within one and two days of the United States.

The new company, forming what is believed will be the largest international air mail and passenger system in the world, is headed by Richard F. Hoyt as chairman of the board and Cornelius Vanderbilt Whitney as president. It is sponsored by men identified with the development of American air transportation and prominent banking interests.

Through Pan American Airways as its operating company, the Aviation Corporation will project and manage an airway system extending 4,023 mi. through 12 countries, aggregating a yearly operating distance of 2,441,366 mi. Of this total 1,992,086 mi. will be flown on a daily schedule between Miami and Havana, and Miami and the Panama Canal Zone, and the remaining 449,280 mi. will be added on a three day a week schedule between Miami and Porto Rico. Extensions already under contract and additional lines to be put into operation will nearly double this aggregate mileage. Contracts were awarded by the Post Office Department at $2 per airplane mile.

Directors Named

Serving on the board of directors of Aviation Corporation of the Americas, which is also the new board of Pan American Airways, R. F. Hoyt, Haydon, Stone & Co., C. V. Whitney, director Guaranty Trust Co., J. T. Trippe, president Pan American Airways; Robert Lehman, Lehman Bros.; Lyman Delano, executive vice president Atlantic Coast Line Railroad; S. M. Fairchild, president Fairchild Aviation Corp.; W. A. Harriman, W. A. Harriman & Co.; Leonard Kennedy, Leonard Kennedy & Co.; George Mixter, Stone & Webster; S. Sloan Colt, vice president Farmers Loan & Trust Co.; E. O. McDonnell, member G. M. P. Murphy & Co.; W. H. Vanderbilt; Grover Loening, president Loening Aeronautical Corp.; Graham B. Grosvenor, vice president Fairchild Aviation Corp.; John A. Hambleton, Hambleton & Co.; R. B. BeVier, president BeVier & Co.; Robert W. Atkins, Hayden, Stone & Co.

The first of the new contracts, calling for daily service between Miami and Havana via Key West is already in operation. The second contract to go into operation will be between Miami and San Juan, Porto Rico, via Cuba, Haiti, and the Dominican Republic. The third contract route from Miami to the Canal Zone will operate via Havana, Yucatan, British Honduras, Nicaragua, Costa Rica and Panama.

Under these contracts and subject to the final approval of the Post Office Department, the company also has the option to extend service at the rate of $2 per mile from San Juan via Windward and Leeward Islands to Trinidad; and from the Canal Zone via Colombia and Venezuela to Trinidad, thence via British Guiana to Dutch Guiana, producing additional contractural routes which will almost double the original mileage.

The company holds contracts with the Cuban Government, giving it preferential commercial privileges at all government airdromes either existing or to be developed. Construction of airports in other countries through which the system will operate has been under way since the contracts were awarded and are reported to be progressing rapidly.

Velie is Testing 170 Hp. Engine

MOLINE, ILL.—A new 170 hp. air cooled radial airplane engine is being tested here by the Velie Motors Corp. of this city. Pete Hill, president of the Travel Air Transportation Co., Wichita, Kan., is making the tests, the new power plant having been substituted for the Whirlwind engine on his Travel Air plane.

The Velie firm now markets a five cylinder air cooled radial engine, the M 5, which develops 45 hp. The new power plant marks the entrance of the firm into the field of more powerful engines.

Form Engineering Firm

SAN FRANCISCO, CALIF. — Formation of the Aeronautical Engineering Co., to offer complete service for aircraft design, construction, maintenance, and repair, and for the sale of accessories, has been anounced here. The company is associated with the aeronautical engineering firm of Jenkins, Pavian & Hillburn of San Francisco. The company maintains offices here and a factory in Alameda, accessible to both the Oakland Municipal and new Alameda Airports.

Testing Sierra Monoplane

OAKLAND, CALIF.—Built by Aircraft Industries, Inc., the new Sierra monoplane is undergoing a 1,000 hr. flight test at the hands of G. H. Willingham, test pilot of the concern.

Dirigible Contract Goes to Goodyear

Great Cruising Ranges Promised For New ZRS-4 and ZRS-5

WASHINGTON, D. C.—Contract to the Goodyear-Zeppelin Corp., for the construction of two great rigid airships for a total of $7,825,000, one to cost $5,375,000 and the other $2,450,000, was officially awarded by the Navy Department October 5. The new ships, it is said, will have ranges two and one-half times greater than the present Los Angeles and will be capable of housing airplanes in special hangars within the hull. The latter are to be launched from the dirigible while in flight.

Externally, the new airships will appear fuller and less slender than the Los Angeles. The fair lines of the hull will not be disfigured as in past practice by external cars containing the engines. The engines and the engineers will be housed within the hull, reducing the resistance and improving the safety. This is one of the lessons learned from the loss of the Shenandoah, where nobody who remained within the hull suffered any injury whatever.

The propellers will be supported on brackets from the hull, driven by the engines through transverse shafts and bevel gears. An important and interesting feature is that the propeller axes can be turned into the vertical position to exert up or down thrust to assist in taking off or landing the airship.

Helium to be Used

The hulls of the new dirigibles, to be known as the ZRS-4 and ZRS-5, will consist of duralumin longitudinal and transverse girders, with steel wire bracing. The girders will be of a new type, stronger and more efficient than hitherto used. The outside will be covered with the characteristic aluminized fabric, drawn smooth and tight. The buoyant helium will be contained in eleven separate cells of gastight fabric. The strength of the hull will be sufficient for storm or squall conditions approximately twice as severe as the Los Angeles could successfully encounter.

A notable improvement will be the provision of no less than three longitudinal corridors, and passageways completely around the circumference of each main transverse frame, giving access to all parts of the ship, so that inspection and repairs can be carried out in flight with a facility never before possible.

N. Y. Firm to Produce Tanks

LONG ISLAND CITY, N. Y.—Industrial Motors, Inc., of this city, announces the beginning of production on duralumin and alclad fuel tanks for aircraft use. The company is located at 4533 Van Dam Street.

World Conference Invitations Listed

Executive and Other Committees Named for Washington Meeting

WASHINGTON, D. C.—The list of 54 nations invited to be represented at the International Civil Aeronautics Conference held at Washington, December 12-14, has now been made public and the executive and other committees have been named. The Department of Commerce is sponsoring the event, for which preparations are now well under way.

Countries boasting developments in aviation and others planning to enter this new field of transportation are included in the list of nations asked to send delegates. The countries invited are as follows:

Albania, Argentine, Austria, Belgium, Bolivia, Brazil, Bulgaria, Canada, Chile, China, Columbia, Costa Rica, Cuba, Czechoslovakia, Denmark, Dominican Republic, Ecuador, Egypt, Estonia, Finland, France, Germany, Great Britain and the British Dominions, Greece, Guatamala, Haiti, Honduras, Hungary, Irish Free State, Italy, Japan, Latvia, Lithuania, Luxemberg, Mexico, Netherlands, Nicaragua, Norway, Panama, Paraguay, Persia, Peru, Poland, Portugal, Rumania, Salvador, Kingdom of the Serbs, Croats and Slovenes, Siam, Spain, Sweden, Switzerland, Turkey, Uruguay, Venezuela.

Executive Committee Named

The executive committee of the conference has been named as follows:

Chairman William P. MacCracken, Jr., Assistant Secretary of Commerce for Aeronautics; Francis White, Assistant Secretary of State; Trubee Davison, Assistant Secretary of War for Aeronautics; Edward P. Warner, Assistant Secretary of the Navy for Aeronautics; W. Irving Glover, Second Assistant Postmaster General; Col. Paul Henderson, vice president, Aeronautical Chamber of Commerce; Dr. G. M. Lewis, director, National Advisory Committee for Aeronautics; Capt. E. S. Land, Guggenheim Fund for the Promotion of Aeronautics; Sen. Hiram Bingham, president, National Aeronautic Association; A. T. Stewart, U. S. Chamber of Commerce; Leighton W. Rogers, executive officer.

Others Announced

Other committees which are now arranging for the conference were announced as follows: Program—Chairman, Starr Truscott, National Advisory Committee for Aeronautics; James C. Dunn, Department of State; Maj. Ira Longanecker, War Department; Lieut. Comdr. George F. Chapline, Navy Department; Maj. Clarence Young, Department of Commerce; George P. Tidmarsh, Aeronautical Chamber of Commerce.

Finance—Harry Guggenheim, chairman, Guggenheim Fund for Promotion of Aeronautics; William McNeir, Department of State; E. P. Howard, Department of Commerce.

Entertainment and Transportation—Maj. Clarence Young, chairman, Department of Commerce; J. C. Dunn, Department of State; Capt. E. E. Adler, War Department; Lieut. Comdr. D. C. Watson, Navy Department; J. F. Victory, National Advisory Committee for Aeronautics; A. T. Stewart, U. S. Chamber of Commerce; Daniel Shaeffer, Aeronautical Chamber of Commerce; Henry Berliner, National Aeronautic Association.

Printing—W. Irving Glover, chairman, Post Office Department; Harry H. Blee, Department of Commerce; A. T. Stewart, U. S. Chamber of Commerce.

Banquet and Luncheons—Lieut. Comdr. W. H. Harrill, chairman, Navy Department; Myron Hofer, Department of State; Edward P. Howard, Department of Commerce; William B. Mayo, Aeronautical Chamber of Commerce; Temple Joyce, National Aeronautic Association.

Publicity—Chance Vought, chairman, Aeronautical Chamber of Commerce; Robert Scotten, Department of State; Maj. Ernest Jones, Department of Commerce; Robert S. Regar, Post Office Department; Capt. E. S. Land, Guggenheim Fund for Promotion of Aeronautics; Ben Lambe, U. S. Chamber of Commerce; Paul Wooten, Conference of Business Paper Editors.

Escort and Reception—Lieut. Comdr. R. H. Williams, General Staff, chairman, War Department; James C. Dunn, Department of State; Lieut. Comdr. W. K. Harrill, Navy Department; H. H. Blee, Department of Commerce; Maj. Donald A. Davison, District Commissioners.

Credentials—Sydney Y. Smith, chairman, Department of State; E. P. Howard, Department of Commerce; Harold F. Pitcairn, Aeronautical Chamber of Commerce; Starr Truscott, National Advisory Committee for Aeronautics.

Hotel Reservations—D. A. Skinner, chairman, U. S. Chamber of Commerce; Harry H. Blee, Department of Commerce.

New York Aero Show is Planned

NEW YORK, N. Y.—To be the first aero show in New York for some years, the New York Aeronautical Exposition has been scheduled to be presented in the Grand Central Palace, Feb. 6-13, 1929. Aviators' Post No. 743, American Legion, composed entirely of war fliers, is sponsoring the event. A complete line of planes, engines, and accessories will be on exhibit, according to John Dwight Sullivan, commander of the post.

Heads Embry-Riddle School

CINCINNATI, O.—Robert L. Rockwell, Lafayette Escadrille flier, has taken charge of the Embry-Riddle Flying School at Lunken Airport. Rockwell will instruct all students of the school in aerobatics and standardize the instruction methods of every pilot instructor. He will also give lectures in the ground school.

Mayer Orders Cessnas

WICHITA, KAN.—E. P. Mayer of the Mayer Aircraft Co. has placed his order for two more Cessna monoplanes following the successes of that type craft in the recent transcontinental derbies.

Gets Robin Sales Rights

GARDEN CITY, N. Y.—Entire sales of the Curtiss Robin cabin plane, manufactured by the Curtiss-Robertson Airplane Manufacturing Co., St. Louis, will be handled by the Curtiss Flying Service, it is announced.

Parks Company Plans Production

Cabin Monoplanes to be Built by $2,000,000 Firm in St. Louis

ST. LOUIS, MO.—Parks Aircraft, Inc., a $2,000,000 concern, to be located at Parks Airport, near East St. Louis, will begin production of a cabin monoplane about January 1, according to an announcement by Russell E. Gardner, Jr., president of the Gardner Motor Co. and chairman of the board of Parks Aircraft, Inc.

Construction of a modern factory, to cost $175,000, was started at Parks Airport the week of Oct. 1. The plant will cover an area 560 by 100 ft. About 300 workmen will be employed, the majority being recruited from the Parks Air College and Mechanics School, which now have an enrollment of more than 200.

Two models of the monoplane, which so far has not been named, are under construction at the field and will be tested in flight about November 1. Details of design for the new monoplane were supplied by Oliver L. Parks, vice president and general manager of Parks Air Lines; Amos O. Payne, formerly with the Swallow Airplane Manufacturing Co., and Richard F. Hardin, former naval officer and designer. While not officially announced, it is expected the new Lycoming air cooled engine will be used in the plane, which will have room for four passengers and a pilot.

Mammen is President

Officers of Parks Aircraft, Inc., in addition to Russell E. Gardner, Jr., are Harry P. Mammen, president of Parks Air Lines, president; Oliver L. Parks, vice president and general manager, and Fred W. Gardner, vice president of the Gardner Motor Co., executive vice president. Directors in addition to the officers named include Oliver A. Anderson, prominent St. Louis broker, and Thomas Reyburn, an officer of the Gardner Motor Co. and Parks Aircraft, Inc., Russell Gardner said. Payne and Hardin have been retained by the company to handle design and production.

The company has been incorporated under the laws of Delaware with $2,000,000 capital. The name Parks Aircraft, Inc., it is understood, takes the place of the name Sunbeam Aircraft, Inc., formerly announced.

Consolidateds for Boeing 80

NEW YORK, N. Y.—Exclusive use of Consolidated (Jones) Tachometers on the Boeing tri-engined transport Model 80, is announced here. Consolidated Panel A, consisting of altimeter, tachometer, oil pressure gauge, and oil thermometer, has also been fitted in the General plane for the Byrd Expedition.

Machine Tool Material New G.E. Development

SCHENECTADY, N. Y.—A new machine tool material which, it is believed, will make possible commercial operation involving the non-machinable class of metals, has been developed in the research laboratories of the General Electric Co., according to a paper read by Dr. Samuel L. Hoyt at the annual convention of the American Society for Steel Treating, held October 11, in Philadelphia. "Carboloy," as the new material is called, is composed of tungsten carbide and cobalt, the carbide contributing the hardness and the cobalt giving the necessary strength for cutting tool use.

The commercial introduction of Carboloy will make it possible to perform such operations as cutting a screw thread on a glass rod, boring a smooth hole in a concrete block, turning porcelain on a lathe and cutting the hardest steels known, according to Dr. Hoyt. Materials which wear down the edge of cutting tools rapidly can be machined easily with Carboloy. A further advantage is the elimination of the taper caused by the gradual wearing down of the cutting tool in machine work.

Quick Company Plans To Build Monoplanes

WICHITA, KAN.—With reorganization of the Quick Manufacturing company of Wichita, intimation has been given by the new officers that a seventh aircraft manufacturing company soon will be in operation in Wichita. A new type of monoplane is contemplated. The new Quick company also plans to build its own engine.

New officers of the company are Charles E. Quick, president; Thomas E. Quick, vice president, and G. B. Winstead, secretary-treasurer. In addition to the officers the board of directors includes G. Curtis Quick and H. Spencer Quick. The new company is incorporated under the laws of the state of Kansas.

The four Quick brothers are fliers of experience, mechanics, and airplane engine designers.

Woodward Orders Loening

LE ROY, N. Y.—Donald Woodward, president of the D. W. Flying Service and owner of the Woodward Airport here, which is about to be opened, has ordered one of the new series Loening Cabin Amphibians. The craft is to be powered by a 500 hp. Pratt & Whitney Hornet engine.

Open New Vanadium Office

PITTSBURGH, PA.—An office has been opened here at 2245-2246 Henry W., Oliver Building, by the Vanadium Corporation of America, New York City. The branch is under the direction of J. Alfred Miller, Jr., general manager of sales of the Vanadium concern.

Mexican Firm Buys Cessnas

WICHITA, KAN.—Three Cessna cantilever monoplanes, it is reported here, have been delivered to the Rapid Transit Co. of Mexico City. The craft are powered with Anzani engines. Air lines are operated out of Mexico City to all important industrial centers of that section by the Rapid Transit Co., according to the announcement.

Form New Propeller Firm at Grand Forks

GRAND FORKS, N. D.—Incorporation of the Master Aeronautical Corp. has just been completed for the manufacture of the Master propeller for use on all types of airplane engines. The concern is now equipping a new factory in Grand Forks. The company will also handle airplane accessories.

Officers of the corporation are: George B. Reynolds, president and general manager; Hubert Rueschenberg, vice president and treasurer, and Richard R. Hopkins, secretary.

The three men turned out a number of the new type of propellers prior to incorporating, and three planes now flying from the Grand Forks airport as well as a plane used by the Morris Aircraft Co., Morris, Minn., are using this propeller, it is reported.

Black & Decker Show Tools

TOWSON, MD.—To further acquaint its distributors with the many applications and uses for portable electric tools, Black & Decker Manufacturing Co. here has held working demonstrations in practically every one of the larger cities in the country. At these clinics were demonstrated the complete line of portable electric drills, hammers, screw drivers, tappers, valve refacers and attachments.

Orders 20,000 OX Pistons

LOS ANGELES, CALIF.—Nicholas Beazley Airplane Co., of Marshall Mo., is reported to have placed an order for $33,000 worth of OX-5 engine pistons with W. B. Huber & Co., here. This order covers the manufacture of approximately 20,000 pistons.

Los Angeles Uses Prestone

LAKEHURST, N. J.—Announcement is made that Eveready Prestone, an anti-freeze solution manufactured by the National Carbon Co., Inc., Cleveland, O., makers of Eveready flashlights, is being used in the water cooled engines of the dirigible Los Angeles.

America First in Aviation Records

Takes Lead from Germany According to Latest N. A. A. Figures

WASHINGTON, D. C.—According to the National Aeronautic Association, American has taken first place from Germany in the record book of aviation. With the 1928 season, American fliers hold 34 world records, Germany 32, France 20, Italy 7, Great Britain 5, Czecho-Slovakia 3, Hungary and Switzerland 3 each, and Belgium 1. The United States, Germany and Italy divide honors for the three most important records—altitude, duration and speed.

At the close of the 1927 season, the United States held 19 records, Germany 25, France 22, Italy 11, Czecho-Slovakia 3, Great Britain 2, and Hungary and Sweden 1 each.

Richard Wagner of Germany, in a Dornier Superwal, carried off the greatest honors of the year by establishing 12 individual world records. Lieut. A. W. Gordon and Chief Boatswain E. E. Reber, U. S. N., added five records to the list with a PN-12 plane carrying loads.

The most important records established in 1928 were those of duration, set by Risticz and Zimmerman, Germans; distance on a closed circuit by Ferrerin and Del Prete, Italian airmen; speed, by Major de Bernardi, Italian, and duration with a 2,000 kg. pay load, by Gordon and Reber, U. S. N.

The altitude record of 38,418 ft. established over Washington last year by Lieut. C. C. Champion, U. S. N., went unbroken this year.

Boone Named to Committee

SAN FRANCISCO, CALIF. — Appointment of Andrew R. Boone, AVIATION correspondent at San Diego, to the Statewide Aeronautical Committee of the California Development Association has been announced by Norman H. Sloane, manager of the association. The appointment was made by Pres. William M. Garland. The association is a statewide chamber of commerce and its aeronautical committee has been largely responsible for development of airports within the state. Its next meeting will be held at San Francisco October 18-19.

Bellanca Built for Peru

NEW CASTLE, DEL.—A special Model CH Bellanca with a 200 gal. cabin fuel tank, has been completed at the plant here and will shortly be shipped to Lima, Peru. Javier Espejo, chief inspector of the Peruvian Air Service, has spent some weeks at the Bellanca factory, having come to this country in the commission of his government to obtain the monoplane.

Trade Tips

WASHINGTON, D. C.—Twenty-five cities have announced their intention of building airports. They are: Jasper, Ala., Sheffield, Ala., Beaumont, Calif., San Diego, Calif., Fort Collins, Colo., Telluride, Colo., Belvidere Ill., Evanston, Ill., Anderson, Ind., Indianapolis, Ind., Washington, Ia., Winnfield, La., Grand Rapids, Mich., Hannibal, Mo., Crete. Neb., New Rockford, N. D., Columbus, O., Huntington, Pa., Martin, Tenn., Menard, Tex., Rutland Vt., Abingdon, Va., Brookneal, Va., and Charleston, W. Va.

MIAMI, FLA.—Blueprints are being made for the proposed new $15,000 airplane hangar at the municipal airport, and bids will be called for after approval of the plans by Welton A. Snow, city manager. The hangar is to be 80 by 100 ft., with shop space along one side, according to present intentions.

STREVELL, IDA.—A beacon and border lights will be installed at an intermediate field to be known as Site No. 10, on the Salt Lake-Pasco route. G. R. Fitzgerald, airways extension superintendent, filed application for the tract, which is owned by Cassia County near Strevell. The lease is for five years.

NEW YORK, N. Y.—Crescent Aircraft Corp., of which O. J. Webster, 200 Broadway, New York City, is president, has plans for the construction of a brick and steel airplane factory at Droyers Point, near Jersey City, N. J., to cost about $250,000.

HAMPTON, VA.—A 65 acre tract has been acquired near here by the Dixie Aircraft Corp., of which R. S. Skinner, Lynchburg, Va., is president. The firm will erect an assembly plant and airport to cost $60,000, it is reported.

WILLARD, O.—The Willard Airport Co. has been granted incorporation papers to conduct an airport here and to transport passengers and freight by plane. Incorporators are Logala Hook, R. C. Blake-Marvin and Mabel Blake-Marvin.

MEMPHIS, TENN.—Plans for a clubhouse to cost about $10,000 are being prepared by the Memphis Aero Club here. The structure is to be erected on Hollyford Road.

NEW ROCHELLE, N. Y.—Leo Aarons, 55 Sutton Manor, this city, is in the market for a plane for private use, it is reported. No particulars as to price or type of plane desired have been given.

HELENA, MONT.—Helena Airways and Flying School, Inc., of this city, has plans completed for the erection of a hangar and shop at the local airport.

Plan Itinerant Flying School

OMAHA, NEB. — Francis "Chief" Bowhan has come to this city to confer with the Pioneer Rubber Co. concerning the establishment of a chain flying school next spring. A Cessna plane has been purchased by the Pioneer Company, and Bowhan is planning to give instruction through Nebraska and later Iowa.

"We are going to operate like the dentists before the railway came to this section," said Bowhan. "Two days a week will be spent in one town and three in another, just according to demand."

Hall Company Starts Factory at Pasadena

PASADENA, CALIF.—Work has been started on the erection of a new $1,000,000 airplane factory at Pasadena, according to the announcement of Charles S. Hall, president of the Hall Engineering and Aircraft Construction Co., which plans to occupy the factory building when it is completed. The factory is to be located on five acres of an 80 acre tract lying between Duarte and El Monte Roads about three Miles east of Pasadena. The remainder of the land will be developed as the Pasadena Airport by the Pasadena Airport and Transportation company, Hall said.

The Hall Engineering and Aircraft Construction Co., plans to build a tri-engined cabin plane for the proposed flight from London to Los Angeles of Capt. Harry Lyons, navigator of the Southern Cross on its flight to Australia. A new type single engined cabin plane is also being designed by this firm.

Pawtucket Meet Under Way

PAWTUCKET, R. I.—A military air meet under the direction of the National Guard Association of Rhode Island is now (October 12-14) underway at What Cheer Airport here. Air races, parachute jumps, aerobatics, bombing, etc., are among the events.

A night bombng attack upon Providence was scheduled October 12. The large planes were to fly to a point above the State House while the anti-aircraft battalion swept the skies with its 1,000,000 candlepower searchlight and fired upon the "invaders."

Coast Firm Adds Fokker

LOS ANGELES, CALIF.—A new Super-Universal Fokker has been added to the fleet of the Aero Corporation of California, according to Fred Hattoom, advertising manager.

Reviews

National Advisory Committee for Aeronautics Report No. 290. Water Pressure Distribution on a Seaplane Float, by F. L. Thompson.

Tests were made on the distribution and magnitude of water pressures over the bottom of a Navy UO-1 seaplane. The tests were made by the National Advisory Committee for Aeronautics at the request of Bureau of Aeronautics, Navy Department, for the purpose of determining water pressures likely to be experienced on seaplane hulls in service. It consisted in the development and construction of apparatus for recording water pressures lasting one one-hundredth second or longer on a UO-1 seaplane float under various conditions of taxying, taking off, and landing.

The apparatus consisted of a number of pistons installed in the bottom of the float. The pistons were mounted in units of four each and there were 15 of these units all connected to the recording apparatus in the cockpit. It was found that the apparatus operated with satisfactory accuracy and is suitable for flight tests on other seaplanes. The equipment is described in detail.

The tests showed that on the UO-1 maximum pressures of 6.5 lb. per sq. in. occur at the step for the full width of the hull bottom. Proceeding from the step, the maximum pressures decrease in magnitude uniformly toward the bow, and the region of highest pressure narrows toward the keel. Immediately behind the step the maximum pressures are very small, but increase in magnitude toward the stern where they reach a value of about 5 lb. per sq. in. There are large portions of the float bottom, both aft and forward of the step, on which the water pressures are never likely to be greater than 2 or 3 lb. per sq. in.

* * *

National Advisory Committee for Aeronautics Technical Notes No. 292. The Drag of A J-5 Radial Aircooled Engine. By Fred E. Weik, Langley Memorial Aeronautical Laboratory.

A full size Wright Whirlwind J-5 engine was mounted on a cabin type airplane fuselage in the 20-ft. Propeller Research tunnel of the N. A. C. A. It was tested at 60 and 100 m.p.h., using three different types of exhaust stacks; short individual stacks, a circular section collector ring, and a streamline section collector ring. The results show that the resistance was slightly less with either the round or streamline collector rings than with the short individual stacks. The streamline collector ring, although having a fair strut section and only two-thirds the projected area of the round section, had the same drag. This is explained by the fact that both rings are behind the engine, where they apparently affect the drag very little one way or another. At 100 m.p.h the drag due to the engine was found to be 85 lb. with individual stacks and 83 lb. with each of the collector rings. At 60 m.p.h similar results were obtained.

AIRPORTS AND AIRLINES

Hancock Establishes New California Line

SANTA MARIA, CALIF.—A commercial airplane line serving the towns of Santa Barbara, Santa Maria, and San Luis Obispo, Calif., has been organized by G. Allan Hancock, backer of the Southern Cross on its flight to Australia, according to the announcement of Raymond W. Stevens, the financier's attorney.

The headquarters for Hancock's new airline will be at Santa Maria, about 75 mi. north of Santa Barbara, and the organization will be known as the Santa Maria Air Lines, Inc. Buhl cabin planes are to be used for passenger carrying on the new routes and in taxi service from the three towns served.

Two new hangars are to be erected at the Santa Maria field, high power lines removed, a complete machine shop installed, and all equipment for night flying, including a 15,000,000 candlepower floodlight. Red boundary and obstruction marker lights will also be placed on the field. A student instruction service will be operated at the terminal field.

M. R. Bellman has been named as field superintendent, Lieut. Hallock Rouse, chief pilot, and C. M. Smith, chief mechanic.

New Packard Hangar Is Nearly Completed

DETROIT, MICH.—The Packard Flying Service, operating at Packard Field here, has nearly completed a new 177 by 60 steel hangar, it was announced recently by H. C. Hartung and Pat Touhey, partners in the service.

The new hangar, Hartung said, will be capable of housing 20 planes. It will be the third hangar erected on the field, the other two being used by the Michigan State Aviation School, whose flying instruction is taken care of by the Packard Flying Service.

Plan Airport for Frederick

FREDERICK, OKLA.—Work on an airport for Frederick will be started this fall, E. E. Napper, secretary of the chamber of commerce, has announced. Plans are being considered to establish the landing field on city property near the municipal lake and park north of Frederick.

Announce New Mail Stops

WASHINGTON, D. C.—Announcement is made by the Post Office Department that Des Moines, Ia., is now a regular stop on the eastbound transcontinental route. It is also stated that effective October 15, San Jose, Calif., will become a stop on C. A. M. 8.

Air Lines Had Least Fatalities

WASHINGTON, D. C.—A report has been issued here with a tabulation of civil air accidents for the period January-June 1928. In this half year 390 persons lost their lives and 276 were injured. In scheduled flying over air routes, however, there were only six fatal accidents, four pliots and two pasengers being killed.

Robertson Moves to New Office Building

ST. LOUIS, MO.—The first unit of the extensive expansion program is now complete with the removal of the Robertson Aircraft Corp. into its new $25,000 office building on Lambert Field. Immediately to the side of the structure is a newly completed $75,000 hangar.

On the old site of the aircraft company, the structures are being torn down to make way for new brick buildings and hangars which will hold the Robertson Flying School, and a depot for passengers.

The office building is a two-story buff brick structure, finished interiorly with walnut and hardwood floors. The hangar, 100 by 240 ft., will contain repair and overhaul shops and a parts department. It is a steel and concrete finished building heated by oil. It also contains two 12,000 gal. gas tanks which will take care of the 10,000 gal. average monthly consumption.

Ticket Office Established

NEW YORK, N. Y.—Formation of a consolidated air ticket office by Air Associates, Inc., this city, is announced. Information and bookings to all parts of the country are now cared for at the Air Associates offices, 35 Fifth Ave. Special trips may be arranged by aerial taxi, while service on airways of foreign countries may also be cared for at the local headquarters.

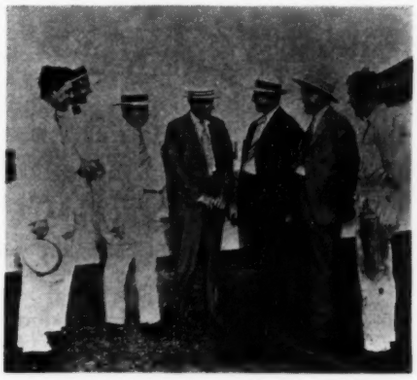
To Resume Ship-Shore Line

WASHINGTON, D. C.—Resumption of the French Line ship-to-shore air mail service is planned with the sailing of the Steamship Ile de France from New York on October 19, according to a recent announcement by the Post Office Department. The Ile de France left La Havre October 10.

Good Will Tour Started in South

New Orleans Newspaper and Aero Firm Sponsor "Aerocade"

NEW ORLEANS, LA.—A tri-state "Aerocade," sponsored by the Menefee Airways and the New Orleans *Item-Tribune,* assisted by civic organizations of the city, started on a good will tour Tuesday, October 9, from this city and was scheduled to return here October 12, after flights through this state, Mississippi, and Texas. Passengers taking part in the tour are leaders in industry, the Mayor and other city officials being among the number. R. E. "Bob" Bauman was managing director of the tour, which is intended to encourage aviation throughout this section.



Executive committee of the "Aerocade" showing, left to right, Clark Salmen, Bob Bauman, A. T. Schwartz, W. S. Gordon, T. Semmes Walmsley, J. C. Menefee and J. R. Wedell.

Among the planes making up the "Aerocade" were two Lincoln-Pages, a Travel Air, and a Ryan, entered by Menefee Airways; a Swallow entered by Shreveport Airways; Waco, Lutcher Stark; Travel Air, John Sellers; Lockheed Vega, Standard Oil Co.; Monocoupe, R. C. Holley; three Army planes; Eagle-rock, the Department of Commerce; and by Huff Daland Dusters and Southern Dusters, three planes, understood to be Keystones.

The Itinerary

The itinerary follows: October 9—New Orleans, Bogalusa, Hattiesburg, Miss.; Laurel, Miss., Jackson, Miss. October 10—Tallulah, Monroe, Rusten, Shreveport. October 11—Mansfield, Natchitoches, Orange, Tex. October 12—Crowley, Baton Rouge, and back to the starting point at New Orleans.

Big Meet Opens Bellanca Airport

Thousands Witness Events in Which 85 Planes Participate

NEW CASTLE, DEL.—With many thousands attending, Wilmington Airport, Bellanca Field, was officially opened here October 6, with a total of 85 planes participating in the races, formation flying, bombing, exhibitions, and other events scheduled. Cash prizes and medals totalling $5,000 were distributed to contest winners.

The meet was held under the sanction of the N. A. A. and under the rules of the Federation Aeronautique Internationale, with the Wilmington chapter of the N. A. A., and the Wilmington Chamber of Commerce sponsoring the show. T. T. Hildebrandt was field marshal, Carl Schory and Henry B. du Pont, referees, F. A. Wardenburg, head timekeeper, Louis Meister, announcer, and Herbert G. Fales, clerk of the course.

Bombing With Flour

Formation flying by nine Liberty powered Keystone Pirate bombers, exhibition flying by Al Williams, Maj. Temple Joyce, and others, parachute jumping to a mark, and bombing of the white circle in the center of the field were features. In the latter contest, sacks of flour were substituted for bombs.

Crowds filled bleachers near the Bellance plant and were kept informed of all events through a radio announcing system. William P. MacCracken Charles S. "Casey" Jones, and many other well known men were present as well as well known planes, such as the Travel Air Aloha, which Martin Jensen flew to Hawaii in the Dole Race. During the day many visitors were shown through the new Bellanca plant, which is now on a regular production schedule. Here, Bellanca planes were on exhibition.

A 10 mi. triangular closed race course was laid out with the starting and finishing pylon immediately in front of the bleachers. A summary of the races follows:

Kreider Wins OX-5 Race

Forty Mile OX-5 Race, nine planes competing, won by A. H. Kreider flying a Challenger plane; elapsed time, 22 min. 98 sec.; average speed, 104.04 m. p. h. Second, J. S. Charles flying an Eaglerock; elapsed time, 23 min. 38 sec.; average speed, 102.6 m. p. h.

Forty Mile Training Plane Race, four planes competing, won by Lieutenant Clark in a Keystone Pup; elapsed time, 21 min. 25 sec.; average speed, 112 m. p. h.

Forty Mile Whirlwind Commercial Plane Race, eight planes competing, won by Ken Unger flying a Travel Air; elapsed time, 17 min. 24 sec.; average speed, 137.9 m. p. h. Second, T. A. Wells, in a Travel Air; elapsed time, 17 min. 50 sec.; average speed, 134.47 m. p. h.

Wasp powered Vought Corsair Race, won by Lieutenant Soucek, four planes competing; Curtiss D-12 powered Marine Curtiss Hawk Race, won by Lieutenant Sanderson, three planes competing; Army Curtiss Hawk Race, won by Lieutenant Gehlback, six planes competing; and National Guard Curtiss Falcon Race, won by Major Owens, four planes competing

To Start Work On New Lines

WASHINGTON, D. C.—Contracts are to be let and construction is to begin on four new airway sections, surveys of which have just been completed, according to an announcement here by the Aeronautics Branch. These sections are: Portland to Seattle on the San Francisco-Seattle Airway; Salt Lake to Burley on the Salt Lake-Pasco route; Lafayette to Chicago on the Cincinnati-Chicago Airway; and the Evansville to Terre Haute section of the Atlanta-Chicago Airway.

It is announced, furthermore, that the Lexington-Omaha section of the Transcontinental Airway is being re-surveyed.

Quarantine Planes at Border

LOS ANGELES, CALIF.—A plant quarantine inspection service covering all air lines which cross the California Border has been organized by G. H. Hecke, director of agriculture for the state. Operating companies affected by this inspection are Standard Air Lines, West Coast Air Transport, and Maddux Air Lines. During the month of September, 43 airplanes carrying 153 passengers were inspected by quarantine officers on the Mexican Border alone.

Hartford District Mail Grows

HARTFORD CONN.—Steady growth in air mail traffic is being noted at a Hartford and vicinity. According to District Manager G. K. Murphy of the Colonial Air Transport Inc. Holyoke Westfield, Springfield, and Northampton, Mass., are growing at a very high rate in the use of air mail and their pouches make up much of the weight of these loads carried from Hartford.

Navy Plans Dirigible Hangar

WASHINGTON, D. C.—Plans for a hangar to house one of the two new dirigibles soon to be contracted for by the Navy Department, were announced recently by Secretary of the Navy Wilbur. The hangar is to be somewhat similar to the one in Lakehurst, N. J.

Corvallis, Ore., Field Dedicated With Meet

CORVALLIS, ORE.—The air circus with which the Corvallis American Legion Post dedicated its new airport recently was declared by participating fliers to be one of the best. About 22 planes took part.

Winners of the events were: OX-5 race, 45 mi.—Fred Sauers, Vancouver, Wash., Travel Air, first; Bev Clark, Portland, Travel Air, second; Tex Rankin, Portland, Waco, third.

Balloon strafing—Eddie Garbutt, Portland American Eagle, first; Tex Rankin, second.

Free-for-all race, 18 mi.—Tex Rankin, first; Bev Clark, second; Fred Sauers, third.

Stunting—Tex Rankin, first; Al French, Portland, Eaglerock, second; Charles Langmack, third.

Relay Race—Al Davis, Portland, American Eagle, and Bev Clark, first; C. C. Graul, Vancouver, Wash., and Tex Rankin, both Wacos, second.

OX-5 special race, 20 mi.—Fred Sauers, first; Dick Rankin, Waco, second; C. C. Graul, third.

Fares are Reduced On Robertson Lines

ST. LOUIS, MO.—The Robertson Aircraft Corp. which operates Ford planes between St. Louis and Chicago daily except Sunday announces a reduction in rates. Henceforth, one way fare between the two cities will be $30 instead of $40, and round trip fare will be $55 instead of $75. A proportionate reduction also has been made in the fare from Springfield and Peoria to St. Louis and Chicago. The plane for Chicago leaves Lambert Field at 9 A. M., arriving at the Municipal Field at Chicago at noon. Departure from Chicago is at 3 P. M., arriving here three hours later.

Fly Stanolind to Kalamazoo

KALAMAZOO, MICH.—The Standard Oil Co.'s Ford plane Stanolind recently spent two days at Lindbergh Field, Kalamazoo, carrying city, county, and airport officials. The plane was then flown to Grand Rapids, where it remained on display in Jack Byrne's hangar for a time and later carried officials of that city for rides. A total of 96 passengers were carried at Kalamazoo and 80 at Grand Rapids.

To Survey New Orleans Site

NEW ORLEANS, LA.—An expert will shortly be sent to New Orleans by the Aeronautics Branch to make a survey of the proposed lake shore airport here. Facilities for both land and seaplanes will be provided at the new field, according to plans.

Plan to Light Standard Oil Beacon at Portland

PORTLAND, ORE.—Three days after the Richfield Oil company flashed on its great beacon sign on Healy Heights in Portland, W. L. Muncy, district sales manager for the Standard Oil Co., announced that his company's 30,000,000 candlepower aviation beacon would be turned on October 14. The Standard Oil beacon is being set up on the observation tower of Council Crest Amusement Park, one of the highest points in the city The light will be about 1,280 ft. above the business district.

Standard beacons at San Diego, Calif., and Seattle, Wash., will be turned on at the same time, completing the company's chain of five along the coast.

The Portland tower will bear the letters "S. O.," for Standard of Oregon, on its sides. The letter will be eight feet wide and 12 ft. high, outlined in Neon tubing. They will flash the continental code for "S. O." The beacon will be turned on at sunset and turned off at sunrise by an astronomical clock.

Robertson Provides Servicing at Lambert

ST. LOUIS, MO.—A servicing station has been installed by the Robertson Aircraft Corp. here on Lambert Field for transient fliers which is complete in every respect. A unique feature of this service is an oil truck, used to service airplanes on the field, which not only carries 450 gallons of gas but also water, oil, and air.

An expert engine and airplane mechanic is maintained especially to give service to transient fliers. A full line of maps and latest information about weather conditions can be had here by the tourists of air, the Robertson company itself making great use of the weather reports due to transport of air mail in and out of St. Louis

Toledo Disp'ay Attracts

TOLEDO, O.—An aviation display placed recently in a local bank window by the American Air Transport Co. of this city after its plane, "Toledo Leadership," completed a tour around the country created considerable interest and drew newspaper stories. A huge board showed the air fare and freight rates to every city of over 50,000 population in the country.

Navy Lists Miami Beacon

MIAMI, FLA.—The revolving beacon at the municipal airport, Gratigny and LeJeune Roads, has been designated by the Hydrographic Office, United States Navy, as an official mariners' and aviators' light and has been placed on the marine maps. The beacon is of 3,800,000 candlepower and revolves six times per minute.

Linked to Mexico

Capt. B. B. Lipsner (left) and Señor Lupsian (right) representing Chicago and Mexico City at inauguration of U. S.-Mexico air mail line.

Traffic Increases On Standard Air Lines

TUCSON, ARIZ.—A 25 per cent. increase in passenger traffic over the Standard Air Lines' Tucson-Phoenix-Los Angeles route has resulted since the resumption of the winter schedule, according to the report of Paul Wall, traffic manager.

The new winter schedule allows coast-bound passengers time to make connections with the San Francisco planes that have been placed on an afternoon schedule by the Western Air Express. The 900 mi. journey between Tucson and San Francisco can now be made in one day by using the Standard Air Lines to Los Angeles, and the Western Air Express to San Francisco. This is a saving of a day and a night over any other means of transportation between these points and permits passengers to breakfast in Tucson, lunch in Los Angeles, and dine in San Francisco.

Dunn Field Firm Opens Office

LONGMEADOW, MASS.—Northeastern Aircraft Corp. of Dunn Field, Longmeadow, has opened offices at Chestnut and Worthington Sts., Springfield, which will be the business headquarters of the concern.

Guardsmen at Fisk Park

HOLYOKE, MASS.—Fisk Park Airport entertained a group of pilots of the Connecticut National Guard Squadron, Sunday, October 7. The fliers staged bombing, stunting, and other exhibitions.

Report Banner Month at Mills

September Volume Showed Five Fold Gain Over Last Year

SAN FRANCISCO, CALIF.—Reports for September show that month to be the banner period in the history of Mills Field, the municipal airport here. There were 2,006 flights and landings of planes coming from and destined for all parts of the United States, with a total of 3,941 passengers, a gain of more than 500 per cent. over the same month last year. The total of flights and landings since Mills Field was established in May, 1927, is 16,489, with 20,080 passengers.

During September the board of supervisors appropriated $55,000 for a new runway and drainage system at the airport and approved a bond issue for $1,700,000 to finance a huge airport expansion program. The measure will be submitted to the voters at the November election. A campaign of education in advocacy of the bond issue has been launched by the airport committee of the board, consisting of Supervisors Milo F. Kent, Andrew J. Gallagher, and Frank J. McGovern.

Receipts from rentals at Mills Field during September totaled $1,763. Supervisor Kent, chairman of the airport committee, states that business at Mills Field has increased so steadily that he expects the enterprise to operate on a self-sustaining basis within a few months.

W.C.A.T. Carried 903 Persons in September

PORTLAND, ORE.—Bach air yachts in regular service of the West Coast Air Transport company carried 903 passengers during September, according to the monthly statistical report of the company. The two planes on regular runs flew 26,326 mi. Total flying time was 240 hr. This was accomplished without accident and with but one forced landing caused by thick weather.

The September total brings the number of pay passengers carried since inauguration of service by the company on March 5, up to 4,933. Total miles flown runs up to 145,846.

Permits Cities to Buy Fields

ROSEBURG, ORE.—Purchase of airports by Oregon municipalities was declared entirely within their constitutional rights by Circuit Judge J. W. Hamilton in a decision handed down here on October 2, in the case of L. E. Clintock against the City of Roseburg. The case was filed in order to test the validity of a $25,000 bond issue voted by Roseburg last June for the purpose of purchasing and improving an airport.

Detroit, Wayne To Have Fields

Locations Selected by City And County for Proposed Airports

DETROIT, MICH.—Both the City of Detroit and the County of Wayne have finally selected sites for a city and a county airport. The city airport will be located in the northeast section of the city, approximately six miles by automobile from the heart of town. If an enlargement project to be voted upon in the election November 6 receives the approval of the people, the port will consist of 395 acres, and, fully equipped, will be valued at approximately $11,000,000.

The County of Wayne, on the other hand, has been authorized to spend $2,000,000 on the acquisition of an airport. Although it was argued by several interested parties that the entire $2,000,000 was meant to go toward the purchase of property alone, the board plans on using part of the $2,000,000 appropriation in developing the site into a modern airport.

The City of Detroit now owns 249 acres, arranged in an L shaped strip on the site. This property valued at $6,000,000, has been definitely selected as the municipal airport. In the November 6 election the people are being asked to favor a bond issue of $5,000,000, to be used to condemn and purchase 146 additional and adjacent acres, and also to equip the entire airport. Practically all of the additional acreage, if it is acquired, will be located along one side of one arm of the L shaped property now owned, making the airport square shaped, with an extension 300 ft. wide, from one corner.

Plan A-1-A Rating

Twenty-three of the additional acres, expected to be acquired, now are owned by the Detroit City Gas Co. The acquisition of the gas company's property alone, it is pointed out, will be sufficient to make the airport correspond to the A-1-A standards. Even though the bond issue fails to pass, it is probable the city will find other means to acquire at least the 23 acres needed to make the site an A-1-A port. The main municipal airport site was selected upon the recommendation of Perry A. Fellows, city engineer.

The proposed site for the county airport tract is a piece of land one mile square located at the junction of Middlebet and Goddard Roads, 16½ mi. west of Detroit.

Both fields planned are expected to be in operation within the next year.

New Stinson School Opens

TOLEDO, O.—A branch of the Jack Stinson School of Aviation in Detroit has been opened here and nearly 50 students have been enrolled.

Report Average Miles to Fields

WASHINGTON, D. C.—Approximately 3.09 mi. is the average distance from the business centers of cities in the United States to their airports, according to a recent compilation by the Aeronautics Branch, Department of Commerce, in which 436 cities were considered. The distances were found to vary from as low as one-quarter mile to as much as 18 mi.

Offices in Washington Opened by Two Firms

WASHINGTON, D. C.—Opening of the headquarters in this city by the National Transport, which operates two sections of the transcontinetal air mail line from New York to San Francisco, and the Transcontinental Air Transport, now planning an extensive passenger and commercial service, was announced here today.

Headquarters for both organizations have been opened at the Carlton Hotel and both will be under the general direction of Col. Paul Henderson, former Assistant Postmaster General in charge of air mail.

The establishment of these headquarters, arranged through Clem W. Gerson, manager of the Carlton Hotel, adds two more prominent commercial aviation organizations to the list of companies which have opened headquarters, which includes the Keystone Aircraft Co., Sikorsky Manufacturing Co., Pitcairn Aviation Co., Boeing Transport Co., Chance Vought Manufacturing Co., Wright Aeronautical Co., and Pratt & Whitney Aircraft Co.

Ask $2,750,000 for Field

NEW YORK, N. Y.—Recommendations drawn up under the supervision of Clarence D. Chamberlin, City Aeronautical engineer, for the expenditure of $2,750,000 on the development of Floyd Bennett Field, Barren Island, were placed before the Board of Estimate recently by Dock Commissioner Michael Cosgrove. Chamberlin is now on a tour of Europe where he will study the various aviation centers there.

Texas Club to Show Models

BEAUMONT, TEX.—An exhibition of model airplanes and airports, together with photographs and literature concerning military and commercial airplanes, will be maintained by the Beaumont Aero Club at the South Texas State Fair to be held here November 8-19. The exhibit will be held for the purpose of building up the airmindedness of the people of East Texas.

Plan to Have Testing Equipment at Oakland

OAKLAND, CALIF.—Plans for the establishment of a complete aircraft proving ground at Oakland Airport have been announced by L. S. Nagle, president of the Oakland chapter of the National Aeronautic Association.

The plan of the local aeronautical body to create such a field here has been heartily endorsed by the Board of Port Commissioners, which in turn agreed to purchase all of the instruments and timing devices needed, which could be used on the airport proper.

The pylons off the field and the surveying costs on the courses which are not on the airport, will be borne by the local N. A. A. group.

It is planned to establish F. A. I. registered and certified courses of from 3 to 25 k.m. in length, which will give Oakland the only proving ground on the Pacific Coast with international standing.

The local N. A. A. also plans intensive work in the schools in regard to proper education of the younger generation along aeronautical lines.

Portland Mail Volume Was High Last Month

PORTLAND, ORE.—About 100,000 pieces of air mail left Portland, either eastbound or coastwise, during September, according to figures taken from postoffice records by Hal E. Nourse, local representative of Varney Air Lines, Pasco, Wash.,—Salt Lake City air mail contractor. On September 25, 5,218 pieces of mail were carried, setting a new high mark for Portland.

About 60 per cent. of the mail went east and the remainder coastwise by Pacific Air Transport. September's total was 141 per cent. greater than that for September of last year and more than 100 per cent. above the total for last July.

Suspends Passenger Service

NEW YORK, N. Y.—Passenger service over the New York-Chicago-Dallas runs of the National Air Transport Inc. was temporarily suspended recently because of the high increase in air mail volume since the reduced rates went into effect on August 1. The company stated that the service would be resumed as soon as larger planes are acquired.

Tri-City to Open Airport

WISCONSIN RAPIDS, WIS.—Tri-City Airways, Inc., Travel Air agent for 10 Wisconsin counties in this section, will officially open the new airport south of this city on October 13 and 14 if the new 80 by 100 ft. hangar is completed in time. Prizes amounting to $2,500 will be offered in various events.

FOREIGN ACTIVITIES

Winnipeg-Calgary Line Is Canadian Firm Plan

WINNIPEG, MANITOBA.—Passenger and express package transportation between this city and Calgary, Alberta, is planned by Western Canadian Airways, Ltd., of Winnipeg, according to Trade Commissioner Richards.

According to present plans the plane will make two round trips a week, leaving Winnipeg in the morning and arriving in Calgary the evening of the same day, thus saving about 14 hr. as compared with train time. The distance is about 830 mi. by air, and it is contemplated that the trip will take about eight flying hours time with a half-hour stop at Regina.

The present fare is $1.25 per mile for passengers or about $1,000 fare from Winnipeg to Calgary. Express rates are on a basis of $50 per pound for a full load with higher rate where less than a full load is carried. The plane to be used in this service is a DH biplane with a cabin body with a capacity of eight passengers. It is powered by a Bristol Jupiter engine.

Plan 1929 Show in England

LONDON, ENGLAND.—The Seventh International Aero Exhibition will be held at Olympia, Kensington W., July 16-27, 1929, it is announced here. The exposition is being jointly organized by the Society of British Aircraft Constructors, Ltd., and the Society of Motor Manufacturers & Traders, Ltd.

New Brazil Line Schedule

PELOTAS, BRAZIL—The Compania General de Empresas Aeronauticas, Lineas Latecoere, which operates an air-water service between Buenos Aires and Paris, France, with Montevideo, Uruguay, as a port of call, announces a new schedule involving night flying between Buenos Aires and Pelotas.

Plan New Line in Brazil

RIO DE JANEIRO, BRAZIL—Daily air mail and express service is planned between Sao Paulo and Rio de Janeiro by the Condor Syndicate. The trip is expected to take three hours. Later a similar line is to be established by that company to Bello Horizonte.

Will Bring Autogyro to U. S.

PARIS, FRANCE—It is reported here that Juan de la Cierva, Spanish inventor, is planning to visit the United States with his Autogyro in the near future.

Record Broken By Lady Heath

CROYDON AIRPORT, ENGLAND.—Lady Heath, British aviatrix, is reported here to have reached an altitude of more than 24,000 ft. in a flight October 4 in her single place Cirrus III powered Moth plane. This is looked upon as a new world light plane altitude record as well as the highest level ever attained by a woman flier. Lady Heath stated 1 hr. 40 min. was required for the climb.

Von Langsdorff and Petersen, German fliers, were credited with a mark of 20,997 ft. at Hamburg the same day, a light plane being employed for the flight.

Plan to Open Ontario Airport November 1

HAMILTON, ONTARIO.—A large airport is to be opened here on November 1, according to Maj. Gen. J. H. MacBrien, president of the Aviation League of Canada and managing director of International Airways of Canada.

The new airdrome is being constructed through the co-operation of International and the City of Hamilton. Governor General Viscount Willingdon has consented to take the chief part in the opening ceremony which, it is said, will be an affair rivalling that connected with the inauguration of the international air mail service out of St. Hubert, Montreal, on October 1. Many guests are expected.

Geared Jupiter Engine is Tested

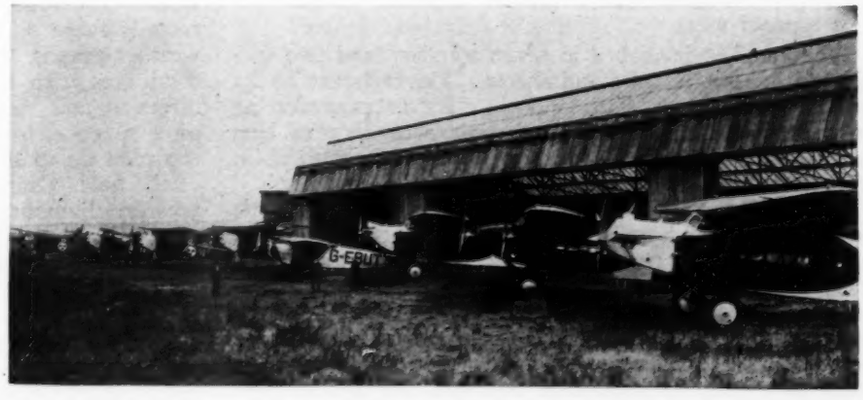
Power Plant Given 150 Flying Hours in Bristol Airplane

LONDON, ENGLAND—Tests were recently completed by the Bristol Aeroplane Co., on the new type Bristol Jupiter Series VIII geared engine, the power plant having been given 150 flying hours fitted in a Bristol "Bloodhound" biplane. The trials were made with the purpose of proving out the most suitable compression ratio for a high compression geared air cooled engine and also of proving out a suitable exhaust system for this type of power plant. The compression ratio of 5.8 was finally selected.

Considerable development work was found to be necessary in regard to the exhaust ring, owing to the fact that with the 2:1 reduction gear the cooling slip stream was not as efficient as with the ungeared engine. Accordingly the area of the exhaust ring and outlet pipes had to be considerably increased and modified as compared with the ungeared engine, in order to meet the official requirements of the Fire Prevention Committee. As a result the exhaust ring area has been increased to 24.5 sq. in., and double outlet pipes have been provided for each cylinder.

It is interesting to note that with the Bloodhound machine considerable increase in performance was registered with the geared engine as compared with the direct drive power plant. For instance, at 5,000 ft. the increase in speed was over 12 m. p. h., or approximately 10 per cent.

Fokkers for Foreign Service



Eight Fokker airplanes at Schiphol Aerodrome, Holland, awaiting delivery to points in Europe, Africa and Dutch East Indies.

THE BUYER'S LOG BOOK

Reliance Tachometer

A TACHOMETER specially designed for aircraft engine use is included in the instrument products manufactured by the Barbour Stockwell Co., Cambridge, Mass. This tachometer, designated Model F, is graduated from 200 to 2400 r.p.m. and furnished with internal gear or for direct drive in 11 different types. Instruments having drive ratios of ½, 1, and 1½ to 1 are available.

Model F tachometer for aircraft.

The flexible shafting used with Reliance tachometers is made up of 17 strands of music wire wound and counterwound in compact form and is positive in action. Whipcord-braided fabric casing with Reliance ball bearing type or U. S. Air Service standard fittings at the instrument end and right angle adapter with connection at engine end, machined U. S. Air Corps standard, can be supplied according to the requirements of the purchaser.

Centrifugal force, operating through the medium of an evenly balanced three-weight governor, is the working principle used in Reliance tachometers. This governor controls the movement of the indicator in both directions over the dial, is noiseless in operation and responds instantly to the slightest variation in speed with smooth action of the indicator. The mechanism is simple and an automatic coupling eliminates any possibility of trouble or of locking of parts when connecting the flexible shaft or other driving member.

Reliance tachometers are also supplied in panels with other instruments.

Vellumoid Sheet Packing

SHEET PACKING made especially for gasoline, oil, and crude distillate connections is being manufactured by the Vellumoid Co., Worcester, Mass. Vellumoid, packing is a strong vegetable fibre sheet, chemically treated, and contains no rubber or rubber substitutes. It combines all of the characteristics needed in a gasket material for this type of work.

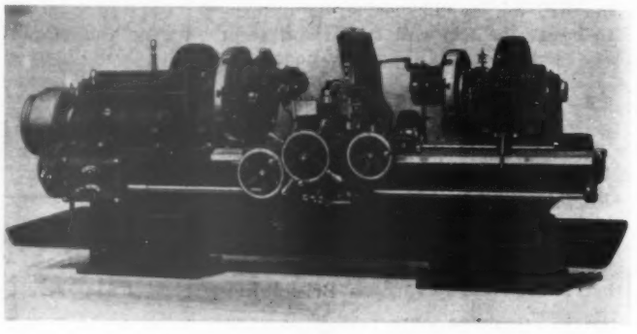
Vellumoid is furnished in seven standard and two special thicknesses in rolls and sheets. The rolls are 36 in. wide and the sheets 36 in. by 36 in. For users preferring to purchase their gaskets ready cut according to blue prints or samples, the company operates cutting plants at Worcester and at its Detroit branch.

Long life and high tensile strength are characteristic of Vellumoid and no shellac is required to be used in applying it. This packing can also be used in air, water, gasoline, oil and crude distillate flange connections where temperature does not exceed 350 deg. F. It also may be used in work with a large number of organic liquids and solvents, in the retention of particularly difficult liquids such as carbon tetrachloride and for low temperature work such as the liquefaction of air in the manufacture of oxygen and the rare gases including helium.

Le Blond Lathes

A COMPLETE line of lathes as well as a number of attachments for them are included in the products of the R. K. LeBlond Machine Tool Co. of Cincinnati, O. The lathes are of rigid design and rugged construction and have a minimum of working parts and controlling levers. All parts are machined in jigs and to standard gauges and templates and each machine must pass a rigid inspection before it is shipped from the factory.

Several models and sizes of heavy duty geared head and cone driven engine lathes are included and turret lathes of the geared head or cone type are also available. The various types of crankshaft lathes produced by the company are of special interest to the engine manufacturer. The company also is in a position to furnish supplementary equipment for the complete turning operations on crankshafts. Portable lathes of various types are also made by the firm.



One of the special crankshaft lathes manufactured by the Le Blond Company.

Friez Weather Equipment

TWO SETS of complete weather equipment for airports are included in the products of Julien P. Friez & Sons, Baltimore, Md. Either of these sets, designated Equipment No. 1 and No. 2, enable the airport operator to make accurate observations and records of all meteorological conditions.

Equipment No. 1 is designed for large airports and consists of a complete set of instruments which permit visual observation of all local weather conditions and records these on charts. After a short experience with weather graphs, the operator is enabled to forecast future conditions with a high degree of accuracy. Changes in direction and velocity of wind are recorded graphically on a rolled strip of paper and these conditions are also recorded on dials which may be placed at various parts of the field. Graphic records are also made of barometric pressure, humidity, temperature and rainfall and to check conditions a mercury barometer, a sling psychrometer, a maximum and minimum thermometer and a standard mercury thermometer are added.

Equipment No. 2 is intended for use at the average airport. It permits visual observation of all local conditions and records graphically barometric pressure and temperature. This equipment is relatively low in cost and may be used to advantage at airports where the more complete equipment is not required.

Right Angle Drill

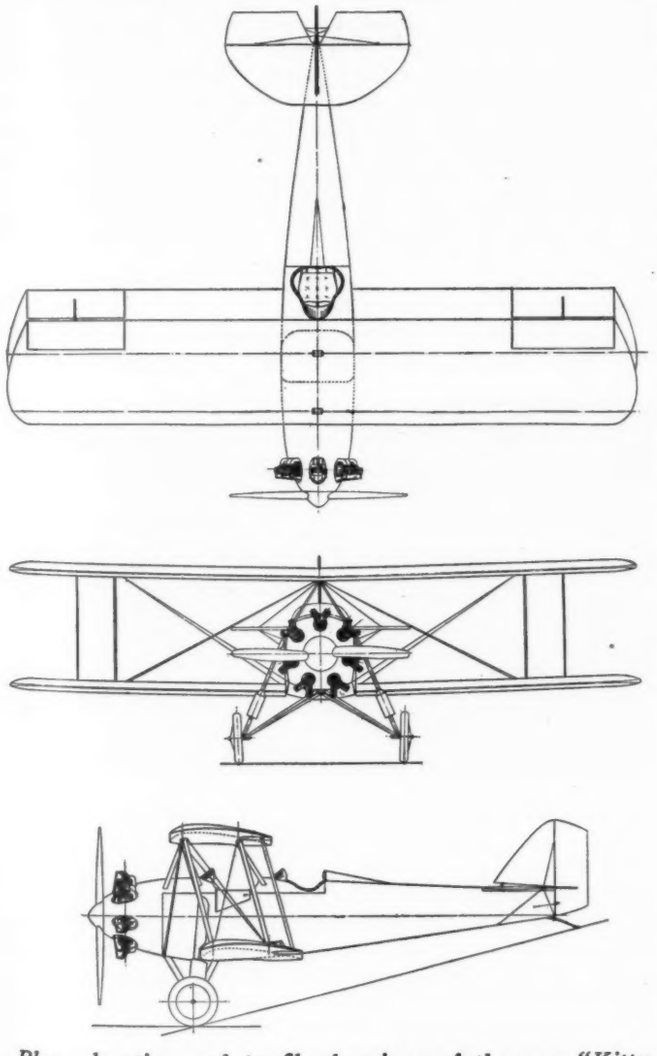
THE MIDGET close quarter right angle drill, manufactured by Charles A. Koza, Rochester, N. Y., fills a definite need in the aircraft factory or repair shop. By its use holes may be drilled in narrow spaces, or out of the way corners or any place where there is one inch of space.

The Midget drill has one chuck and 6 ft. of ⅜ in. flexible shafting. It is designed to be used in connection with any ¼ in. electric drill. The operating end is ⅞ in. wide and will drill holes up to ¼ in. diameter in metal or wood in a corner ½ in. by ⅝ in. in size. Other models are made to work in spaces up to 12 in.

The "Kitty Hawk"

(*Continued from page* 1191)

terplane and cabane struts are constructed of streamline tubing and double streamline tie rods are used in the external bracing. Wing fittings are of 1025 sheet steel



Plan, elevation and profile drawings of the new "Kitty Hawk" three passenger, open cockpit biplane.

bolted to the spars in such a way as to offer a minimum resistance to the wind.

Access to the forward or passengers' cockpit is gained through a door in the left side of the fuselage and the cockpit is sufficiently large to permit of the removal of the gasoline tank without disturbing any part of the plane. All fuel is carried in the fuselage tank which has a total capacity of 37½ gal. The tank is constructed of welded aluminum with a horizontal baffle plate forming two separate compartments, the upper division being a 10 gal. gravity tank. The tank is supported by steel straps attached to the fuselage members. A hand pump is installed in the rear cockpit for emergency use and a gauge for the main tank is placed on the instrument panel. There is also a sight gauge in the filler cap of the gravity tank. Forward of the fire wall and above the engine is located a welded aluminum oil tank having a capacity of three gallons.

An Elgin instrument panel installed in the rear cockpit consists of altimeter, tachometer, oil pressure and temperature gauges, gasoline gauge and clock all mounted in a single unit. Throttle controls are provided in both cockpits and dual stick and rudder pedal control may be installed when the plane is to be used for instruction.

Landing gear is of the split type and has a tread of 7 ft. 4 in. It is so designed as to be easily removable for repair or replacement of parts. The axle is welded to the lower vee struts eliminating torsional strains that would occur in a bent axle. Circular rubber discs slipped over the lower ends of the compression struts, which telescope into short lengths of tubing at the bottom, are used to absorb the landing shock. Discs can be easily added or removed as desired.

All empennage units are constructed of welded steel tubing, Linoiled and covered with fabric. Both elevators are made up on a common torque tube with the horn attached in the middle of the tube and inside of the fuselage. The stabilizer is in one piece and is adjustable through a range of 2 deg. negative to 4 deg. positive. Adjustment can be made from the rear cockpit while the plane is in flight, the mechanism for this consisting of a push pull rod actuated by a lever in the cockpit.

Stabilizer and fin are braced by double tie rods from the fuselage to the stabilizer spar and single rods from the stabilizer spar to that of the fin. The diagonal spar of the fin is bolted to the fuselage in such a way as to be adjustable. Ailerons and elevators are actuated by means of push pull rods and the rudder by means of cables.

The entire plane is of rugged construction and all parts subjected to greatest wear are made amply large. Load factors and other specifications are in accord with Department of Commerce requirements.

Specifications furnished by the manufacturer are as follows:

Length overall	21 ft. 11 in.
Height overall	8 ft. 6½ in.
Airfoil section	U. S. A. 27
Span	28 ft.
Chord	4 ft. 6 in.
Total wing area	233.4 sq. ft.
Stabilizer area	16.10 sq. ft.
Elevator area	9.25 sq. ft.
Fin area	4.54 sq. ft.
Aileron area	22.3 sq. ft.
Rudder area	5.25 sq. ft.
Weight empty	1,115 lb.
Gross weight	1,888 lb.
Power plant	96 hp. Ryan Siemens 7
Wing loading	8.52 lb. per sq. ft.
Power loading	19.65 lb. per hp.
High speed	112 m.p.h.
Cruising speed	90 m.p.h.
Landing speed	40 m.p.h.
Gasoline capacity	37½ gal.
Oil capacity	3 gal.
Range at cruising speed	500 mi.

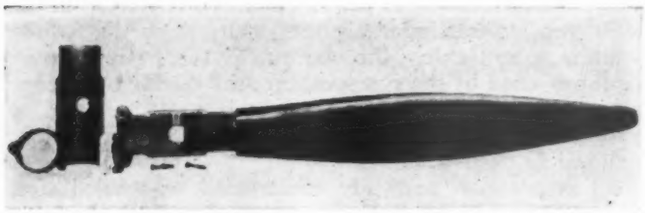
Development of Aircraft Propellers

(*Continued from page* 1190)

ted and the empirical constants obtained for making the correct assumptions for use of the blade element theory.

These results, from an English point of view, are elaborately given in "The Design of Screw Propellers" by Henry C. Watts, published in 1920. The methods described by Henry C. Watts did not meet the full requirements of the American propeller designer. The American designers preferred to view the complete propeller whenever possible and use non-dimensional coefficients of performance in order to predict the performance.

In order to satisfy the demands for these coefficients experimental research on air propellers was conducted by the National Advisory Committee for Aeronautics, by W. F. Durand and E. P. Lesley. The results of their model



One blade and the hub of a Miarta adjustable pitch propeller.

tests on various families of propellers appear in N. A. A. C. reports and the coefficient for performance were published in 1925 N. A. C. A. Report No. 141. The results of this research are extremely useful but the fact that test coefficients apply to only geometrically similar propellers constitutes a strict limitation to the use of such coefficients. It must be realized also that coefficients based on model tests are not applicable to full scale propellers unless corrections are made to compensate for differences in tip speed and for fuselage interferences, not included in the model coefficients. In addition to this it must be realized that these models generally used the thick aerofoil sections used in the design of wooden propellers and that often the results do not agree with actual full flight test of the thin sectioned metal propeller in use today.

The National Advisory Committee for Aeronautics has just completed a large wind tunnel at Langley Field, Virginia, for the purpose of testing full sized propellers with the full sized fuselage and engine behind them. It is felt that this wind tunnel will give test results that can be applied directly to modern usage, yet there are so many variables that enter into aircraft propeller design that it is believed that considerable experience and engineering judgment must be used to know when and where various test data can be applied.

The Bureau of Aeronautics of the U. S. Navy designs and tests many experimental propellers each year. The purpose of these tests is to improve plane performance where possible; reduce fuel consumption and to lower propeller manufacturing costs. Both the Army and Navy design practically all of their own propellers, furnishing the contractor with a finished drawing with all dimensions. This method places the responsibility for the propeller performance squarely up to the Services.

Let us now in general terms describe the problems that are involved in aircraft propeller design. A rotating propeller offers a definite resistance to being rotated, and this resistance varies as a function of the speed of revolution. The power absorbed varies proportionally. The speed of revolution of any particular propeller will, therefore, be determined to a large extent by the power available to turn it. On the other hand each different type of engine develops its power most efficiently at some definite speed of revolution, depending on the type of engine. The propeller, in order to be considered a practical success, must be so designed that the torque caused by its resistance at this speed just equals the torque which the engine can exert to turn it. If the torque required by the propeller be either greater or less than the torque available the propeller will run slower or faster respectively until the necessary equality of torque is obtained. If this were all, the problem would be simple, but account must be taken of the fact that power required to turn the propeller depends not only on the speed of revolution but on the airspeed of the craft on which it is used. In other words, each combination of engine and aircraft will require its own particular design or changes made to already existing designs in order that the engine will have the desired speed of rotation when operated at the speed of the plane.

Now, independently of this foregoing requirement any given propeller has its maximum efficiency at a given ratio of air speed of the plane to tip speed of the propeller. It, therefore, is required that when the engine has its required r. p. m. when the plane is moving forward at its resultant speed that the propeller shall be operating under the conditions that cause its maximum efficiency. For planes that cruise at lower than maximum speed it is desirable that the propeller maximum efficiency occurs at cruising speed in order that fuel consumption will be low. In high speed fighting planes it is is desirable to have maximum efficiency at the maximum speed. So it is seen that the type of service required from a plane governs to some extent the propeller used.

In addition to the previous requirements that the propeller must fit the engine and plane and have as high an effi-

A Hartzell wooden propeller used on a Fairchild-Caminez engine in a Waco 10 *biplane.*

ciency as can be attained, it must be safe and reliable against structural failures. The propeller in being rotated, is subject to severe stress due to centrifugal force, upon which stress is superimposed the bending moment due to the thrust which acts similar to a load on a cantilever beam. These two main stresses are further complicated in that there is a torsional stress in the blade due to the fact that the centre of gravity of any one section and the centre of pressure are not the same point. Other causes of stress in a propeller blade are bending moment due to torque and gyroscopic stresses.

In order to provide enough material to withstand these stresses the propeller designer is confronted with the problem that increase of cross sectional area or moment

of inertia alone is not sufficient, for centrifugal force is increased by the addition of material. The distribution of material in a propeller blade such that each section will be aerodynamically as good as possible, yet still have sufficient material properly distributed to make it sufficiently strong, is the eternal problem in propeller design. Until about 1923 nearly all propellers were made of wood. Up until that time the proper wood, properly put together, was the best material available. The suitability of a material for propeller manufacture depends largely on the strength/density ratio, and various experiments using different materials were tried. The most promising experiments prior to 1923 were the use of a steel covering over a wooden interior; and later, the use of aluminum and aluminum alloys. Hollow steel blade welded along the trailing edges showed promise but trouble with the weld together with the cost of manufacture failed to get this method into quantity production. However, "Micarta," a phenol product used as insulators, proved successful and is used today for certain types of propellers. In 1923 the first "Reed" slab type of propeller came into use. It was made of a slab of rolled aluminum alloy and then twisted to the desired pitch. This type was later changed, for reasons of strength, to the Reed "R" type which somewhat resembles a wooden propeller reproduced in metal.

Until about 1924 all aircraft propellers were of the fixed pitch type. That is, it was impossible except in a specially equipped shop to change the angles of the blade to fit new conditions of airspeed or revolutions per minute. The detachable blade type was the result of this restriction. This type consists of a steel hub into which are fitted the duralumin blades. The blades can be set on a plane table to any angle desired. From a standpoint of performance and cost this type has come into wide use in the Army, Navy, and commercial fields. A given design of blade will fit a larger number of conditions of flight and hence dies can be made for those blades greatly in demand, which reduces their cost. The blades are of aluminum alloy produced under the trade name of "25S." This material has a high strength density ratio, can be forged and heat treated.

Detachable Blade Type Has Many Advantages

The advantages of the detachable blade type of propeller are numerous and mainly that the same design of blade used in two and three blade combinations, together with small changes in diameter give virtually several families of propellers. Experience shows that if a detachable blade is designed of uniform pitch, but is set in the hub to operate at a lower effective pitch, that the performance is bettered. In effect the lower setting gives a propeller of non-uniform pitch, so it is a case of the pitch all along, the blade fitting the actual air flow that exists. In this respect, non-uniform pitch blades, when used with the modern air-cooled engines give better results than a uniform pitch. However, for best results the setting cannot be too far above or below the designed angle as in the extreme cases some sections would be working at either too high an angle of attack while at the other extreme some sections might have negative angles of attack. Further advantage can be taken of the adjustable pitch feature in that a better climb and take-off can be attained by reducing the setting about one or two degrees from normal. The propeller, for example, is set to have its maximum efficiency at the maximum speed of the plane. This setting in this example will be called the normal setting. Now if this setting is reduced prior to take off it will permit the propeller to turn faster or "race" at full throttle. This is a dangerous practice unless the limiting r. p. m. of engine and propeller are known. However, this is often done to get off with a heavy load and then throttling down when in the air.

Another advantage of the adjustable pitch type is that in an emergency due to shortage of propeller blades, the plane can be kept in the air by using a larger diameter blade and cutting it off to the correct diameter and setting it so as to give the required r. p. m. It is not maintained that this gives the best propeller possible but it is often resorted to instead of keeping the plane in the hangar waiting for the arrival of the correct blade.

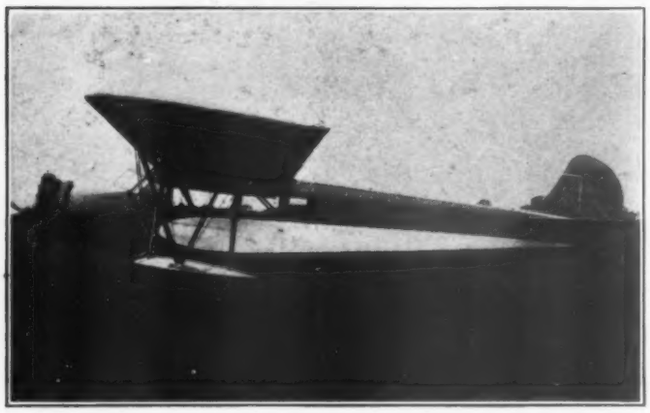
An order of Curtiss-Reed slab type propellers awaiting shipment from the factory.

Some research on the effect of high tip speeds on propeller performance was conducted by Dr. Stanton at the National Physical Laboratory in England during 1926 and 1927. Tests were carried out on aerofoil sections at air speeds up to twice the velocity of sound. (The velocity of sound in air is normally from 1,080 to 1,125 ft. per sec., depending upon the temperature.) From the preliminary work it appears that the shape of the most efficient aerofoil section for use at such speeds differs considerably from that suitable for the ordinary range of tip speeds—that is, speeds below 1,080 ft. per sec. Following this preliminary investigation, studies of model propellers (using R. A. F. 31A section) operating at various tip speeds was begun. The results of these tests show that the loss of propeller efficiency begins to occur at a tip speed of about 760 ft. per sec. and this loss is not serious until a speed of 850 ft. per sec. is reached. Beyond tip speeds of 850 ft. per sec. there is a more rapid decline in propeller efficiency and this loss is greater on propellers with thick sections than on those with thin sections.

It can be seen from the contents of the preceding paragraph that in cases where the tip speed is too high, either a three or a four-bladed propeller with the resultant smaller diameter, or gearing down the propeller must be resorted to in order to obtain the best results.

With the development in the last few years toward increasing engine horsepowers and speed of rotation, it is practically imperative that propellers be made of metal and that gearing will become more and more necessary as this development continues. With competition so keen in the commercial field of aviation and the demands for increased performance in the military branches of aviation, it is more and more important that the propeller operate at its highest efficiency yet still be safe and reliable, and at the same time be of such construction to permit of

The SENIOR AIRSEDAN



EIGHT PLACE—DUAL CONTROL

Specifications

Weight Empty	3,000 lbs.
Wing Span	38 ft.
Wing Area	462 sq. ft.
Length	35 ft. 8 in.
Useful Load	3,000 lbs.
Seating Capacity	2 Pilots, 6 Passengers

Performance

High Speed (Sea Level)	135 m.p.h.
Cruising Speed	110 m.p.h.
Landing Speed	45 m.p.h.

Power Plant

Engine	Wasp
Horsepower	425
Fuel Capacity	140 gals.
Oil Capacity	15 gals.

Equipment

Starter; Brakes; Metal Propeller; Compass; Air Speed Indicator; Navigation Lights; Tachometer; Altimeter; Clock; Fire Extinguisher; Fuel, Oil Pressure, and Oil Temperature Gauges; Air Corps Throttles; Strainer and Fuel Valve; Exhaust Manifold; Cabin Heaters.

Price, $18,500

Flyaway our Field, Marysville, Mich.

Buhl Aircraft Company
MARYSVILLE, MICHIGAN

manufacture in quantity production at as low a cost as possible consistent with quality of the product.

The aim in all propeller design should be safety, high performance, and economy which closely coincide with the general aim of all aircraft products.

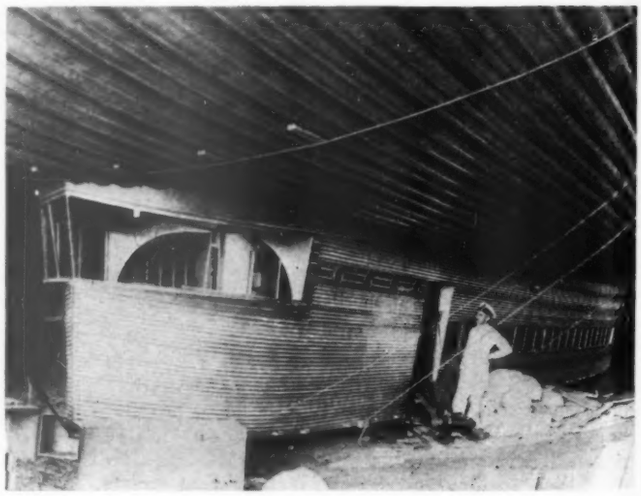
The Slate Dirigible

(*Continued from page* 1189)

light the cabin. Another set of two of about 10 hp. are used to operate the hoists for cargo elevators and one on the water line between boiler and condenser. Only 5 gal. of distilled water is carried in the entire steam generating plant and but 1 gal. of water is consumed in every 1000 mi. of travel at approximately 100 m.p.h.

Two kinds of fuel are used; natural gas or ordinary commercial gas and refined crude oil. A perfect weight balance is thus effected whereby the gaseous fuel lifts the weight of the liquid fuel. This relieves the gross lift of ship from fuel weights and gives a balancing arrangement that permits the ship to gain or loose altitude by burning one or the other fuels. Any desired altitude level can be maintained by burning an equal quantity of both to secure a balance of weight.

The new propulsion principle embodied in the Slate dirigible has been called the "air displacement" system. It involves the displacement of the air in front of the ship, the passing of the air stream to the rear and its replacement on the rear taper of the ship. This is accomplished by the centrifugal blower, which has a disc diameter of 58 in. and an operating speed of 4,000 to 6,000 r.p.m. The

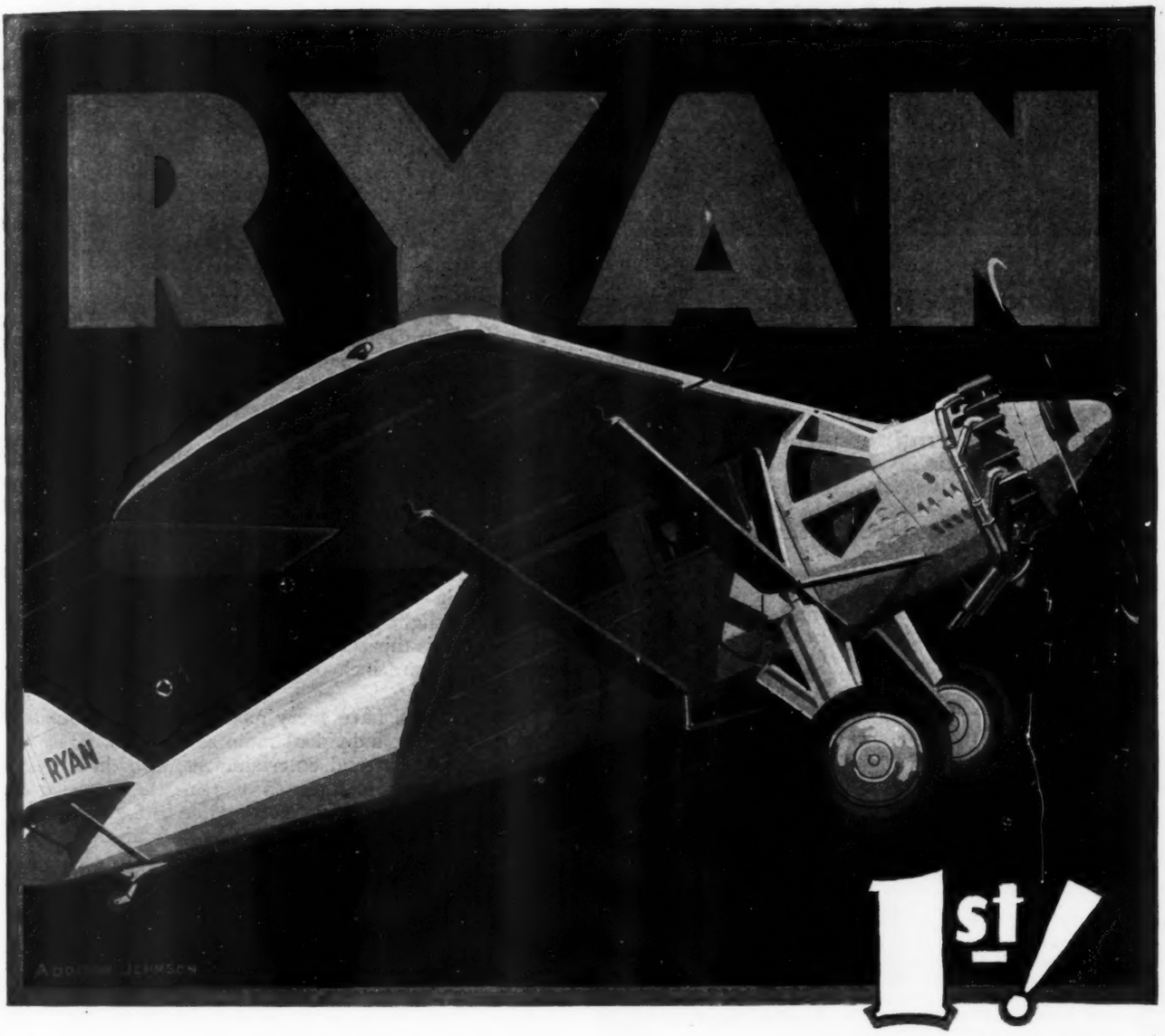


An exterior view of the cabin of the Slate all-metal dirigible now under construction.

air is sucked in from the area just ahead of the nose and thrown back along the ship's surface. A partial vacuum is created ahead, inducing a suction on the ship. The air stream flowing back across the rear taper fills the aperture made by the ship's passage and builds up a positive pressure at the rear which drives the ship forward.

There is no vibration from the turbin. The blower always has an even load pull and the slip stream travels at very high velocity averaging close to 300 m.p.h. and extending an appreciable distance outward. This protects the ship with a cushion of air from all forms of atmospheric conditions that would otherwise endanger the shell or affect perfect flying control. Easy and absolute flying control is secured by the slip stream that is forced by

A SISTERSHIP TO THE "SPIRIT OF ST. LOUIS"



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1st **Cabin Plane Across the Atlantic!**

1st **Cabin Plane over Pike's Peak with Passengers!**

1st **Cabin Plane to reach Altitude of 24,100 Feet!**

1st **In Performance...*slowest landing* and *fastest take-off* of all cabin planes at the National Reliability Tour, by Official test!**

1st **In Production and Sales among Whirlwind cabin plane manufacturers!**

Efficient engineering and production methods enable us to include finest appointments and equipment with the Ryan Brougham's remarkable everyday performance, at $12,200 Factory.

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RANKIN FLYING SERVICE . . *Portland, Oregon*
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San Diego, California ***St. Louis, Missouri***

AM11

THE BERLINER MONOPLANE, a commercial and training plane ideally appointed for use by the private owner, has been designed by one of America's outstanding aeronautical engineers in collaboration with nationally known pilots. It is manufactured throughout from the highest grade of materials and built by skilled and seasoned airplane mechanics.

In service its clean lines, beauty and attractiveness of design prove again the adage that "Planes that *look right*, *fly right*". Although far more stable than other ships of its size, it has that maneuverability demanded by the most exacting pilots. The Berliner Monoplane gives maximum performance with minimum maintenance.

Every part of this monoplane has been designed as though *it* were the most important part of the ship, and has been engineered to reduce air resistance without sacrificing a single comfort or safety factor. The graceful and efficient cantilever wing, sturdy chrome molybdenum steel fuselage and husky fittings combine to make this the outstanding monoplane offered in the world's market for 1928.

SPECIFICATIONS

Length overall, 25 feet 10 inches; height overall 8 feet; airfoil Goettingen 398; span 36 feet; area of wings and ailerons 219 sq. feet; weight empty, 1400 lbs.; gross weight loaded, 2300 lbs.; high speed (full load, sea level), 105 m.p.h.; landing speed, 41 m.p.h.; absolute ceiling, 16,000 feet.

Berliner Monoplane features are plentiful, including exceptional visibility, easy access to passenger compartment, ease of rigging, inspection and maintenance, interchangeable parts, readily removable radiator and gas tank, improved stabilizer control, and highly efficient hydraulic-spring shock absorber.

Berliner Monoplanes are being produced in quantity under Department of Commerce approved type certificate No. 39. An ample number of new OX-5 motors are available. The plane is built to take motors up to 220 HP.

Price: With Curtiss OX-5 Engine, $3,290, Flyaway Hoover Field, Washington, D. C.

Excellent dealer territory still open. Write!

BERLINER AIRCRAFT COMPANY
ALEXANDRIA VIRGINIA

the contour of the ship to pass over the tail control surfaces while the adjoining atmosphere is normal.

The effect of this positive guiding control is that the ship can hold a position under its own power, directly over any desired spot. While this position is maintained passengers or freight can be taken on or discharged by the unique Slate elevator. The liquid fuel tank is lowered by cable and the ship is allowed to drift back enough to bring this tank cable at about a 5 deg. angle, then the elevator is operated up and down. The elevator will always travel on the under side of this guide line and regardless of the movement of ship, the elevator, always terminates at the spot where the fuel tank rests. This spot can be a building top, a field, the deck of an ocean steamer, or a point in the mountains.

Two automatic steam turbine hoists power the loading and unloading elevator system. With the ship floating free it is in no danger from sudden shifting air currents and can rise or settle or shift from side to side, but in no way affecting the elevator from continuous service. This obviates the use of landing fields or mooring masts.

Another feature is the combination balloonette. This is a gas and air tight cloth bag inserted inside the metal shell. In the lower portion air from the outside flows freely through an open passage and regulates the atmospheric pressure on inside of shell to same pressure as on outside, at all altitudes. This relieves the ship shell of any stress. The blower propulsion further relieves all driving strain so that as the ship increases speed there is only a very slight increase of skin friction from the slip stream and it is this skin friction that is evenly distributed over every square inch of shell surface that propells the ship.

Passengers will have every modern accommodation for comfort including individual radio ear phones. This will provide amusement and entertainment, also the historical data of country as it is passed over, or the receiving and sending of messages to any point while in flight.

A great safety factor to passengers and ship is provided by the fact that lifting gas is free inside the metal shell with no compartments and under constant pressure from the action of the balloonette bag. If the shell were punctured and the gas escaping the ship would maintain its perfect balance and fly for 100 mi. or more before slowly settling to earth. And should this gas take fire it would not be at all disastrous.

Merchandising Airplanes

(*Continued from page* 1188)

with dual controls, permitting its use for instruction purposes. The front cockpit controls could be removed when desired. At that time, the average buyer was an airport operator.

With the steadily increasing number of private pilots, and the acceptance of the airplane as a means of rapid transportation by the public, the individual buyer may be almost anyone. Motion picture actors are buying and flying their own planes. Musicians, salesmen, lawyers, and doctors are among those, who are learning to fly. Those who have learned, are buying planes for their personal use.

In a country, as thoroughly converted to buying on contract as the United States it is only natural that the prospective buyers would want terms. Until recently, cash was the answer. Gradually, however, the finance companies have come to recognize the advantage of handling airplane paper, and insurance companies have learned

At the Albany Airport:

The underground circuits are:

TRENCHLAY

Here is the ideal cable for airport circuits. It is light and flexible; easy to handle, install and splice.

Built of inert materials with nothing to rust or corrode; proof against moisture and highly resistent to earth acids and alkalies.

Economical!

Several other large airports have already adopted Trenchlay.

Our engineers simply await your invitation to submit samples and full details.

ROME WIRE COMPANY

Division of General Cable Corporation

ROME, NEW YORK

KINNEAR
HANGAR DOORS

Experimenting

THERE is no class of people in the manufacturing or general business world who can better appreciate the cost of experimenting than those engaged in the aircraft industry and its allied lines.

It has taken many years of studious effort and costly experimenting to bring aircraft to its present position in the public eye. The planes had to be developed to a point where enough safety was approximated to induce the public to become sufficiently interested to make use of them. Now they are rated as "Common carriers."

We have been carrying on experiments in large doors for hangars and aviation buildings. Airport owners and operators, whether they be corporate, municipal, or private, have all been through costly experiments with various kinds of large doors. Surely, it is a costly experiment to put on an unsatisfactory door that does not operate quickly, easily, and economically. Hangar doors in particular must operate expeditiously when called upon, else valuable time is lost.

Our experimenting has been done. Full sized models were built, both hand and motor operated, tried out, rebuilt, and worked on until the "bugs" were eliminated. We offer you the completed door ready to use. You are relieved of costly experimenting to find something that will suit your needs. The Kinnear Hangar Door may be designed to suit any type of hangar or aviation building. It will operate expeditiously when called upon. The entire opening of a hangar may be cleared in a few minutes. A Kinnear engineer is ready to work out your problem.

The Kinnear Manufacturing Co.
MAKERS OF KINNEAR AUTOMATIC FIRE DOORS
General Offices:
5 Fields Ave. Columbus, Ohio

District Offices in:
BOSTON, 294 Washington St.
CHICAGO, 128 N. Wells St.
CINCINNATI, 526 Walnut St.
DETROIT, 812 Ford Bldg.
NEW ORLEANS, 730 Hibernia Bk. Bldg.
NEW YORK, 342 Madison Ave.
PHILADELPHIA, 503 Wesley Bldg.
PITTSBURGH, 617 Oliver Bldg.
KANSAS CITY, MO., 111 Railway Exchange
WASHINGTON, D. C, 1135 Investment Bldg

KINNEAR ROLLING · DOORS

that an airplane of approved design, flown by an experienced pilot, is not a highly perishable commodity. Today, it is possible for dealers operating under a strong distributor, to get satisfactory financing at a low carrying charge. Retail sales are bound to increase, when this practice becomes general.

The salesmen, themselves, must be thoroughly familiar with the plane they are selling. It is not absolutely essential that they be able to fly alone, but it is highly desirable that they have sufficient dual flying experience to know something about flying. They should be able to talk airplanes and flying intelligently. They must master the Department of Commerce Air Regulations and the Air Traffic Rules. They must learn operating costs, so that they may tell the prospect what it will cost him to fly a plane. They must be able further to reconcile the airplane language of the cost of operation to the

Front quarter view of a Cessna monoplane, powered with 10 cylinder Anzani engine

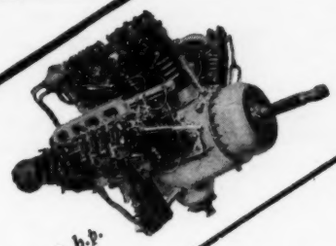
usual methods of quoting costs. Telling the layman, that it costs $15 an hour to fly a plane, it will strike him as being exceedingly expensive, unless the salesman takes the trouble to show him that in an hour he will travel about 100 mi. and that 15 cents a mile is quite inexpensive for individual traveling.

There is no mystery in selling planes. No necromancy is employed. It is as matter-of-fact as selling automobiles, clothing, or groceries. It takes plenty of hard work and determination, and an intelligent application of the uses of the airplane to the needs of the purchaser.

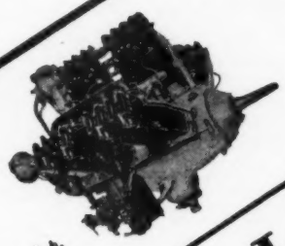
Many airplane merchants today, who would like to connect with a factory-distributor-dealer organization, hesitate to do so because they feel that the commission on the sale of a single plane is too small, and that they can get more favorable discounts on a direct-from-factory-franchise. It is true that the discounts allowed by the manufacturers to their distributors are small, but even so, the dealer aligning himself with a strong factory-distributor-dealer organization has many advantages over his direct-from-factory-franchise brother, even though the latter makes a larger commission on each sale. The problems of the factory are varied, and are chiefly those pertinent to the manufacture of planes. While the sales end is not neglected, it is not possible for the factory to give close personal attention to the needs of a multitude of dealers covering a wide territory. The dealer, under such an arrangement, is left more or less to his own devices. He plays a lone hand. In the end, he finds that his larger discount per plane is more than absorbed by his increased sales cost.

The distributor, on the other hand, is concerned with the selling of planes and plane service only. He is vitally interested in the success of every dealer under him. His salesmen work with the dealers on their territories, and assist in closing business that might otherwise be lost. The combined advertising of the distributors and dealers, in any territory, has a strong influence on the buying public. The distributor knows the problems of the dealer in his particular section. As a result, he is able to give

The enterprise of "Lorraine" is an assurance of constant progress toward more powerful and more reliable aircraft.

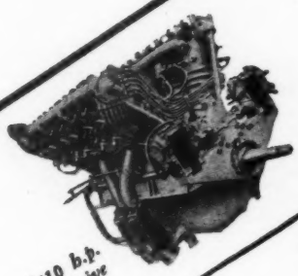


450/500 h.p. Geared

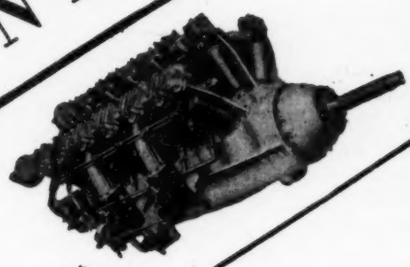


450/480 h.p. Direct Drive

LORRAINE

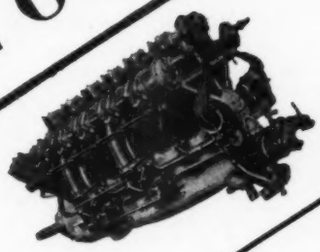


400/410 h.p. Direct Drive

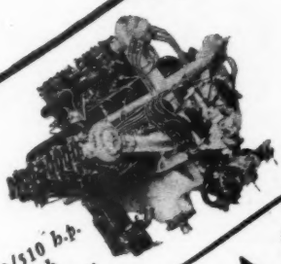


650/750 h.p. Geared

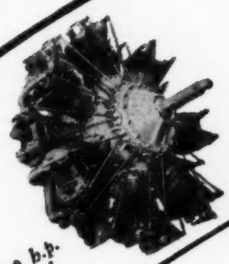
Aircraft Engines



650/700 h.p. Direct Drive



480/510 h.p. High Compression



470/540 h.p. Air Cooled

230/270 h.p. Air Cooled

100/110 h.p. Air Cooled

More than 5,000 engines are in service throughout the world. They have been fitted to all the different types of planes and have established themselves through their remarkable reliability. In actual use they have more than equalled the remarkable successes which they have had in the brilliant long distance flights of the past few years.

SOCIÉTÉ LORRAINE

Factory at Argenteuil — *Seine et Oise, France*

THANK YOU *for mentioning* AVIATION

him counsel and assistance in working out plans for solving those problems. The dealers in such an organization are co-operators, rather than competitors. They exchange ideas with the distributor, and with each other. When one works out a difficult problem, he does not keep it a secret, but passes it on to his fellow-dealers. In crossing each other's territories, they stop for a visit. They become successful by helping each other.

During the past two years, the demand for new production ships has far exceeded the supply, with the result, that salesmen have been inclined to be lax in their selling methods. With the old, established factories rapidly increasing their output, and new factories coming into being and not putting their products on the market until they have a definite production schedule under way, the supply will soon catch up with the demand. Then, real selling will begin, and then, the factory with a well established distributor-dealer organization, each member of which is carrying on an aggressive sales campaign, will be able to increase its sales over its competitors, who have been content to drift with the tide, during the times when the buyer had to wait his turn for a plane. The far-sighted individuals in the industry realize that this time is rapidly approaching. They are building up their organizations for the time when real selling will have to be done. When that day arrives, the factories that have strong distributors, and who, in turn, have well-knit dealer organizations, will dominate in the field.

The retail sellers of planes—the dealers—are training their salesmen in merchandising airplanes and aviation service. The alert salesman is absorbing all data possible during this time of easy selling. He is busy also, building up contacts that will be profitable to him when he must seek the buyer, instead of having the buyer seek him.

Aviation Country Clubs

(*Continued from page* 1187)

Pynchon, Jr., and William H. Harkness are included in the membership committee.

Among perhaps some of the more prominent members of Aviation Country Clubs are Hon. William P. MacCracken, Jr., Assistant Secretary of Commerce for Aeronautics; Edward P. Warner, Assistant Secretary of the Navy for Aeronautics; Comdr. Richard E. Byrd, U. S. N. (Ret.); Cornelius Vanderbilt Whitney, and William B. Leeds.

Five types of memberships in Aviation Country Clubs, Inc., are available. These are proprietary, life, active, junior, and non-resident. The holder of any of these memberships is entitled to the privileges of all the clubs formed. The initiation fees are set by the national organization, which collects them and then turns the money over to the individual club to which the new member will be attached. The annual dues for the various types of memberships are set by the individual clubs from year to year. This money likewise is collected by the national organization, and is focused on the club with which the member is affiliated. A small percentage of the dues is retained by the national organization to defray operating expenses.

"All of the property and assets of the club, acquired and to be acquired, are vested in the proprietary memberships," says the club brochure. "The proprietary membership grants all the privileges of the club by the payment of annual dues. It is transferable for a cash consideration, by gift or bequest, to any person eligible for

"I would not be without the HEYWOOD STARTER"

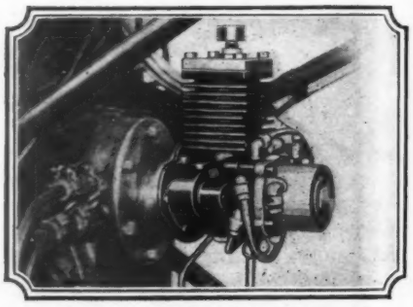
Mr. R. S. Fogg of the Concord Aircraft Co. has been flying for 10 years, and was an army instructor. He has been operating flying boats over Lake Winnepesaukee for five years. As a dealer in aircraft, he specifies Heywood Starters on all motors he sells. He has carried over 15,000 people without a mishap.

"PERSONALLY, I would no more be without the 'Heywood' on my ship than I would be without a starter on my car. This season I bought a Waco-Edo 10 with a Wright J-5 motor for use in my short flight passenger service.

"I immediately installed the Heywood Starter, and since then, have made 800 starts without a single failure. It makes starting of high-compression motors simplicity in itself—push a button on the dashboard and instantly the motor starts, and such performance is essential in short flight work.

"I cannot too highly recommend the Heywood Starter for use in all modern aircraft." R. S. Fogg

R. S. Fogg of the Concord Aircraft Company, Concord, Conn., with his Waco-Edo 10 flying boat.
Inset: On the wing.



Close-up of Heywood High-Pressure Injection Starter

Instant response and efficiency regardless of weather conditions has earned for the Heywood Starter the stamp of approval of leading aircraft pilots and manufacturers.

To overcome all starting difficulties heretofore experienced, specify Heywood Starter equipment adaptable to practically all engines used in aircraft.

Complete details of Heywood high-pressure injection starter on request.

Manufactured by

The
Heywood Starter Corp.
6547 St. Paul Avenue, Detroit

Gordon
AEROTOGS

Commander Richard Byrd and executive staff for his South Pole Expedition, dressed in Gordon Aerotog flying suits, helmets and mittens made especially for them by Gordon & Ferguson, Inc., Saint Paul, Minnesota. The Commander's suit is of natural unplucked Alaska seal skins.

RADIO EQUIPMENT FOR AIRPLANES and AIRPORTS

Now airplane companies and airports can equip with radio apparatus backed by the name and reputation of the Radio Corporation of America. Full information on radio telephone, radio telegraph and beacon radio equipment for communication between plane and plane, plane and airport, and airport and airport may be obtained from

Radio Corporation of America
233 Broadway New York City

More Aircraft Manufacturers in 1929 Will Equip with

KINNER

SEVEN OUTSTANDING FACTORIES producing light commercial aircraft this year are standardizing on the Kinner five cylinder radial air cooled 100 horsepower engine. Low price and high performance make this power plant a very popular one, and new contracts are now being signed for deliveries on 1929 production schedules. We urge you to plan your next year's market now

Motor Price $1875 f.o.b. Glendale

(U. S. Dept. of Commerce Approved Type Engine, Certificate No. 3)

Kinner Airplane & Motor Corp.
San Fernando Rd. and Grand View Ave.
GLENDALE, CALIF.

C & L 158

This is one of the most popular blow-torches we have ever made. It is more expensive than the 158 because it is made for much harder use. It is designed for the man who uses a blow-torch in his daily business and demands not only excellent performance but rugged ability to stand rough handling. 32 contains the most advanced, patented C & L blow-torch improvements. It also has a red handle. Sure sign of satisfaction.

Patented
Clayton & Lambert
improvements mean
longer, better service

A BLOW-TORCH looks husky, and it has to do a lot of hard, rough work. But it's a pretty fine instrument, and unless it's made just right any one of a number of things can put it out of commission.

Clayton & Lambert want to supply you wth a blow-torch that will give you full value for your money. So we've not been satisfied merely to give you a blow-torch that does its job in fine style. We've also made it so it can stand a lot of very hard use, and still keep right on working.

Ordinarily if you strianed or broke the handle you'd open the gasoline container and lose your compression. But Clayton & Lambert handles are fixed in such a way that an accident to the handle won't hurt anything else. By the way — notice the handle. It's *red*. We made it red so you could identify a Clayton & Lambert torch clean across the hardware store.

Another thing is the plug in the bottom. We've put a lead washer in there, so when you take up the screw you seal that opening tight; it can't leak. Not just when it's new. Always.

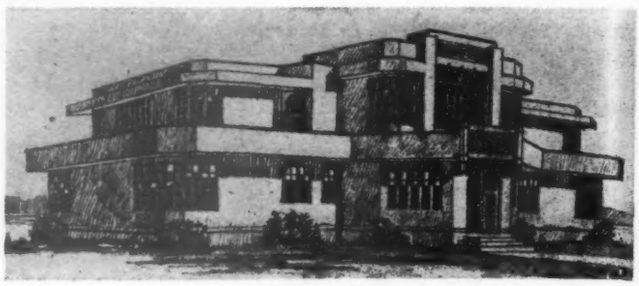
Those are just examples of improvements, many of them patented, that Clayton & Lambert has made in every part of a blow-torch. They're mighty important, for they make the difference between short and long use, between ordinary and excellent service.

As a result, Clayton & Lambert blow-torches are the most popular in the world. And so many people buy them that we can give you the benefit of the economies of volume production. You can't find better value than in Clayton & Lambert.

CLAYTON
&
LAMBERT
MFG. CO.
Detroit, Michigan

membership in the club. A sound financial policy must embrace the maximum safety and investment features of these members, who, through their purchase of proprietary shares, provide the greater part of the finances necessary for the establishment of the flying club.

"The equity of these memberships will be protected by the investment of the club funds in large acreage in close proximity to the principal cities of the United States, together with the improvements of such acreage by the construction thereon of club buildings, flying fields, and so forth, financed through the sale of all types of memberships, but vested entirely in the proprietary membership shares. This affords an ever increasing monetary value to a proprietary member's equity, so that in case a sale of his rights becomes advisable, or should such rights pass to his estate, his equity is more than adequately protected.



A sketch of the model clubhouse designed by Warren Shepard Matthews.

"Life members have all the privileges of the club for life, and are forever exempt from all dues.

"Active members have all the privileges of life members, but shall pay such dues as are from time to time decided upon by the local Board of Managers.

"The sons and daughters of members, between the ages of 16 and 21, may be elected to junior memberships in the club. The privileges and dues of such memberships will be decided upon from time to time by the local Board of Managers.

"The national Board of Governors may elect to non-resident membership persons living outside a radius of 50 mi. of any city where a club is established. Both the initiation fee and the dues of such membership are handled by the National Treasurer to be used for the advancement of the club as a whole, and to provide a reserve fund to take care of contingencies."

The rapid establishment of Aviation Country Clubs throughout the country, it is believed, will be facilitated by obtaining a large non-resident membership. The non-resident members will act in co-operation with the national organization committee, and by this means can aid materially. An official publication is soon to be issued by the national body, which will keep the non-resident members informed as to the activities of the organization. The initiation fee, as set by the club, is $50, while the annual dues are $10.

Warren Shepard Matthews, New York architect, has drawn up plans, which are intended to serve as a model for the clubhouses constructed by the individual clubs. A sketch of the two-story structure, designed by Mr. Matthews, and the plans of the first and second floors are reproduced. One of the features of the design is the plane-like shape, which will make the clubhouses easily recognized from the air.

Black and Bigelow, Inc., air transport engineering firm of New York, has prepared an estimate of the investment required for establishing one of the individual clubs. This estimate is based on the construction of a clubhouse

ALL BUT ONE
(69 *out of* 70)

National Air Race Winners were HASKELITE equipped

	HASKELITE
Race No. 1—Class A, N. Y. to Los Angeles..	users ALL
Race No. 2—Class B, N. Y. to Los Angeles..	" "
Race No. 3—Class C, N. Y. to Los Angeles..	" "
Race No. 4—Class A, S. F. to Los Angeles..	" "
Race No. 5—Class B, Oakland to Los Angeles	" "
Race No. 6—Closed Course Event No. 2....	" "
Race No. 7—Closed Course Event No. 3....	" "
Race No. 8—Closed Course Event No. 4....	" "
Race No. 9—Closed Course Event No. 2—	HASKELITE users ALL but 1

Marine Observation Race.....	HASKELITE users ALL
Army Observation Race	" " "
First Pursuit Group Race.....	" " "
Two-Place Observation Race..	" " "
Pursuit Free-for-All Race.....	" " "
Navy Pursuit Race.....	" " "
VB2B Squadron Race.....	" " "
Third Attack Group Race.....	" " "
Army Service Pilot Race.....	" " "

85%

of American built planes using plywood exhibited at International Aeronautical Exposition were HASKELITE-equipped. Twenty-three companies exhibiting 33 of the 39 such planes shown are HASKELITE users.

Send for valuable blue print booklet of aircraft applications.

Haskelite Manufacturing Corp.
120 South LaSalle Street, Room 1120
CHICAGO. ILL.

California Panel & Veneer Company
955 S. Alameda St.,
Los Angeles, Cal.

Railway & Power Engineering Corp., Ltd.
Montreal, Toronto, Winnipeg, New Glasgow

PLYWOOD
HASKELITE
PLYMETL

A10-13-Gray

MILESTONES OF PROGRESS

They come from all over

FROM every part of the country, men come to the SWALLOW plant in Wichita to buy SWALLOWS.

Where we have a dealer in the territory, of course we turn the business over to him. Yet there are some places where there is no Swallow dealer as yet, and we are forced to sell direct to the customer.

It's "dollars to doughnuts" that before 1928 is over every state in the Union will be the home of a number of new 1928 Swallows. Somebody will get that nice business. Will it be you?

Better write or wire us today to see if YOUR territory is still open.

SWALLOW AIRPLANE CO.
WICHITA, KANSAS

LUDINGTON

Ludington Philadelphia Flying Service, Inc.

PHILADELPHIA AIRPORT

COMPLETELY EQUIPPED to handle any kind of aircraft construction or repair work. We will gladly estimate on the construction of steel tube fuselages, wings or any aircraft parts to your specifications either in quantity or singly.

Let us overhaul and repaint your ship this winter. No storage charges until overhaul is completed.

How about attractive slip covers to protect the upholstery in your cabin jobs. We make a specialty of these.

Our replacement wings for Waco 9's and 10's with spar end straps installed and 18" walkways are well known. All wing repair parts in stock for these ships.

Look to Your Spark Plug Cables

Corona-eaten Cable Is the Thief of Engine Power

MODERN airplane motors with their high compression require such high voltages for ignition as to set up a corona condition around the spark plug cables. Corona releases free ozone from the air which attacks plain rubber cable and shortly causes it to leak electricity and seriously affects the ignition in the cylinders.

Packard Lac-kard Cable has the insulation protected by a stout braid which is hermetically sealed from the attacks of ozone by the application of multiple coats of a special pyroxylin lacquer. (It is corona proof.)

Packard Lac-kard Cable was specially developed for airplane service. It is the last word in high tension ignition cable and should receive the serious consideration of every airplane manufacturer and operator. Nothing in connection with the internal combustion engine is more important than ignition and ignition is absolutely dependent on the cable.

Packard Lac-kard Cable is for sale by leading automotive and aeronautical jobbers throughout the United States and Canada. Complete information regarding this vitally important airplane unit can be secured by writing us direct.

"If it isn't Packard—it isn't Lac-kard"

The Packard Electric Company, Warren, Ohio

according to the plans drawn up by Mr. Matthews. The engineering company has prepared also a report of the annual operating cost for such a club. Particular emphasis is given the hourly cost to a member for the use of one of the club planes. The estimate and the report are being used as a basis in the formation of the first flying clubs.

The information compiled by Black and Bigelow, Inc., is as follows:

Investment

Club House: Construction of club house as per plans of Warren Shepard Matthews. Basement to contain heating plant. First floor to contain lounge, dining room, kitchen, office, manager's bedroom, bath, first aid room, locker room, showers, check room, chef's bedroom, service dining and bedrooms and pantry. Second floor to contain upper lounge, grill room, women's retiring room, card rooms, bar, three bedrooms with baths, observation decks. Total cost of construction as per estimate of architect: 66,000 cu. ft. at 50c	$33,000.00
Furniture	2,141.00
Office furniture and equipment, about	450.00
Rugs and carpets	350.00
Dining room and kitchen equipment	2,970.00
Nucleus of Club Aviation Library	100.00
Electric lights, telephone, water connections	1,000.00
Architect's fee, five per cent	1,650.00
Field and Flying Equipment: 80x80x20 ft. with 80x20 ft. lean-to for shop, storeroom, etc. Hangar of steel construction with galvanized steel siding and roofing, concrete floors and foundation piers, one toilet and wash sink. Figures based on $2.50 sq. ft., for 8,000 sq. ft.	20,000.00
Installation of cesspool, water, electric light, etc., about	750.00
Construction of tennis court	1,500.00
Landscaping, gravel walks, etc., about	1,500.00
Four light two-place, dual control, airplanes complete with Curtiss OX-5 engines, approximate price, delivered, $3,165 each	12,660.00
One spare OX engine, about	1,000.00
Spare parts for airplanes and engines	1,000.00
Four parachutes at $350 each	1,400.00
Fordson tractor complete with golf course wheels, rollers, mower, road drag and snow plow attachments	2,324.00
Light truck with "station wagon" body	800.00
Weather apparatus including wind cone and mast, barometer, etc.	100.00
Fire-fighting apparatus	510.00
Shop equipment, including lathe, motor, tools, etc.	1,200.00
Shop office equipment	250.00
Engineer's fees, incidentals and contingencies, about	1,745.00
Organization, New York Office and Administrative	15,600.00
Totals investment required exclusive of property	$104,000.00

Annual Operating and Maintenance Cost

Depreciation and obsolescence of club house building, five per cent. of $33,000	$1,650.00
Depreciation of hangar and shop, five per cent. of $20,000	1,000.00
Depreciation of club house furnishings, 15 per cent. of $6,006	901.00
Depreciation of shop and office equipment, fire extinguishers, weather apparatus, etc., 15 per cent. of $2,060	309.00
Depreciation of airplanes, parts, etc., exclusive of engines (allowed for under variable costs) 20 per cent. of $11,060	2,212.00
Depreciation of tractor and accessories, 20 per cent. of $2,324	465.00
Depreciation of truck 25 per cent. of $800	200.00
Flying insurance on airplanes including, fire, theft, tornado, crash, public liability and property damage, 20 per cent of $12,660 (quotation from Farrelly and Co.)	2,532.00
Fire insurance on club house, hangar, shop, furnishings and equipment, one-half of one per cent. on $60,456	302.00
Maintenance of buildings, clubhouse, hangar and shop, three per cent. of $33,000 and five per cent. of $20,000	1,990.00
Incidental costs due to maintenance of field, about	500.00
Operation of motor truck 7,500 mi. at 10c	750.00

The STEARMAN
equipped with Edo Pontoons

The adaptability of the Stearman to Pontoons is but another indication of the excellence of Stearman design.

Scientifically powered, intelligently engineered, and accurately built, the Stearman makes an ideal plane for water use.

Present production planes are adaptable for both Edo floats and land gear.

APPROVED TYPE CERTIFICATE NO. 55

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The Skyways, Inc., of Michigan, Flint, Michigan.
Rogers Aircraft, Inc., 3901 Angelus Mesa Drive, Los Angeles, Calif.
The Varney Air Line, 310 Balboa Bldg., San Francisco, Calif.
The Metro Aircraft Company, Oakland Airport, Oakland, Calif.
The Midcontinent Airways, Inc., 22nd Floor Philtower Bldg., Tulsa, Okla.
The Stearman Aircraft Company, Wichita, Kan.

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Can be quickly erected with unskilled labor

Steel sash and galvanized sheets riveted to sidewall sections in shop before shipment thus greatly reducing time of erection. To erect bolt sidewall sections together raise and bolt on trusses, purlins and braces, apply roof sheets and glaze the sash and building is ready for business.

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Arrived BFD. PA. Mo. 5 Day 21
Hour 325 PM Distance 1100 miles.
Flying time—Hours 15 Minutes
Average speed . . . 73.3
Amount of gas used . 103 GAL.
Amount of oil used . . 1½ GAL.
Interesting and unusual happenings enroute:
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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912—

Of AVIATION, published weekly at New York, N. Y., for October 1, 1928.
State of New York, } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared R. Sidney Bowen, who, having been duly sworn according to law, deposes and says that he is the Editor of AVIATION and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse side of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are:
Publisher—Aviation Publishing Corporation, 250 West 57th Street, New York, N. Y.
Editor—Earl D. Osborn, 250 West 57th Street, New York, N. Y.
Managing Editor—R. Sidney Bowen, Jr., 250 West 57th Street, New York, N. Y.
Business Manager—George Newbold, 250 West 57th Street, New York, N. Y.

2. That the owner is:
Aviation Publishing Corporation....250 West 57th Street, New York, N. Y.
Earl D. Osborn.....250 West 57th Street, New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding one per cent or more of total amount of bonds, mortgages, or other securieies are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relastockholders and security holders as they appear upon the books of the tion, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other secuities than as so stated by him.

R. SIDNEY BOWEN, JR.

Sworn to and subscribed before me this 19th day of September, 1928.
(Seal.) HANNAH GOLDENSON.
(My commission expires March 30, 1930.)

Annual Operating and Maintenance Cost

Operation of tractor, about	$400.00
Rent of gasoline tank and pump	5.00
Telephone service, excluding calls charged to members	300.00
Office supplies and incidentals, about	250.00
Heating of club house and shop, about	750.00
Water light and power, about	370.00
Annual overhaul of four airplanes at $1,000	4,000.00
Allowance for test flying, about	300.00
Salary of general manager and instructor	7,000.00
One first class mechanic at $65 per week	3,380.00
One mechanic's helper at $35 per week	1,820.00
Salary of steward and wife (with room and board)	2,100.00
Typist—clerk at $25 per week	1,300.00
Legal and engineer's fees and supervision of accounts, paid by New York office	0.00
Annual audit of books	500.00
Contingencies and miscellaneous, 10 per cent	3,529.00
Total annual operating and maintenance cost	$38,815.00
Variable Flying Costs Per Hour: Gasoline, oil, and grease, about	$3.00
Engine depreciation (basis 500 hr. life and cost $1000)	2.00
Allowance for crash losses not covered by insurance	1.50
Engine overhaul every 100 hr. at $200	2.00
Contingencies and miscellaneous 10 per cent	.85
Total variable charges, hourly	$9.35

Reconciled Balance Sheet

Financing		
Investment required		$104,000.00
Membership Enrollment—84 Proprietary Membership shares ($1,000 each)	$84,000	
10 Life Members, Fee $500	5,000	
75 Active Members, Fee $200	15,000	$104,000.00
Operating		
Annual Operating and Maintenance Cost		$38,815.00
Variable Flying Cost (2000 hrs. at 9.35)		18,700.00
		$57,515.00
Annual Income—Dues, Proprietary Members 84 at $150	$12,600	
Dues, Active Members, 75 at $100	7,500	
Hangar rental, with service (5 planes at $30 per mo.)	1,800	
2000 hr. use of club planes at $15	30,000	
Repairs	2,000	
Profit on sale of gas, oil and accessories	615	
Revenue from 600 hr. flying by pilot at $5	3,000	$57,515.00

"It is assumed that the revenue from the dining room, grill, card room, bedrooms, and tennis courts will cover the wages and board of maids, waiters and cooks, and the upkeep of tennis courts," Anson A. Bigelow, vice-president of Black and Bigelow, said in commenting upon the report of his firm. "All other expenses such as insurance, depreciation, which includes obsolescence, maintenance, light, heat, water, telephone, salaries of the secretary, steward, housekeeper, general manager, and mechanics, have been fully covered in the estimates.

"As wide variations occur in the purchase or lease of property, and its preparation as a flying field, no estimates have been made covering such variable investment requirements. It is understood, however, that Aviation Country Clubs are covering these costs fully through revenue obtained from initiation fees. There will be, of necessity, therefore, variations in the budgets of the various clubs.

"As all fixed expenses applicable to the operation of club planes are set up on an annual basis, and are partially covered by the yearly dues from members, it will be necessary to fix hourly charges for the use of the planes at a figure which will permit a surplus above the hourly variable cost, sufficient to meet the cost of operation of the club less other revenue. These variable costs are estimated at $9.35 per hour and, on a basis of 500 hr. of flying yearly for each airplane, a charge of $15 an hour without a pilot is recommended in order that the total revenue may balance expenditures. For instruction and

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aggregates over $1,000,000 per aircraft

Constructive total loss
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Personal Accident
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and
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More aviation claims paid by our organization than by all other organizations throughout the world.

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Policies have been issued over a long period of years and, among others, in favor of Federal and State Governments, Boeing Air Transport, Pacific Air Transport, Colonial Air Transport, Colonial Western Airways, National Air Transport, Western Air Express, Robertson Aircraft Corp., Colorado Airways, Northwest Airways, Walter T. Varney, Inc., Southern Dusting Co., Philadelphia Rapid Transit, Stout Air Service, Boston Airport Corp., American Railway Express, Ford Motor Company, Fairchild Aerial Surveys, Fairchild Flying Corp., Pacific Marine Airways, Pitcairn Aviation, United Cigar Stores Co., Royal Typewriter Co., Hamilton Maxwell, Inc., Pulitzer and other race meetings, Universal Motion Picture Corp., Fox Film Corp., American Airports, Inc., Jefferson Airways Corp., Midplane Sales & Transit Co., Stinson Aircraft Corp., Thompson Aeronautical Corp., Atlantic Aircraft Corp., Pratt & Whitney, Caddo Co., Chas. Rogers Productions, Canadian Transcontinental Airways, Ltd., Western Canada Airways, Ltd., S.C.A.D.T.A. of Colombia, S. A., Andian National Corp. of Colombia, S. A., Maddux Air Lines, Scenic Airways, Standard Oil Co. of Cal., Richfield Oil Co. of Cal., Trans-continental Air Transport, The Daniel Guggenheim Fund for the Promotion of Aeronautics, Gene Tunney, and many others including Col. Charles A. Lindbergh, Sir Hubert Wilkins, Anthony Fokker, and other leaders in aviation.

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Perfect performance—complete control—the ship of ships for flying safety into and out of small fields—for flights long or short!

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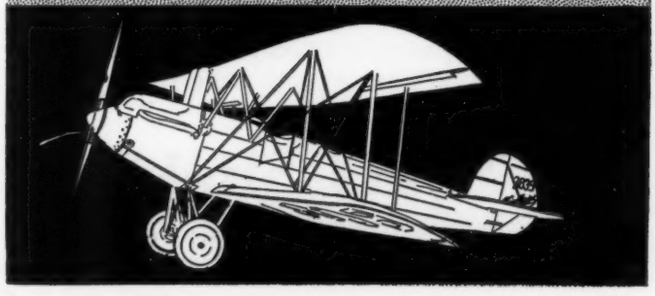

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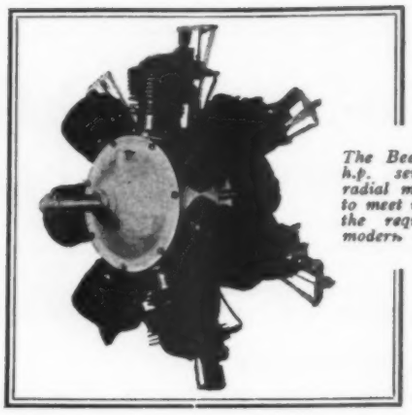

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THE BEETLE Aircraft Motor is dependent on Chrome Nickel Steel, the fatigue factors of which are known, to take the mounting stresses.

Simplicity in design and the use of a minimum number of moving parts has assured reliable operation and long life for the BEETLE. It is entirely free from complex mechanism and may be readily understood by novice or expert.

It is the aim of this company to build an engine that pilots will like to fly. All our efforts are toward that goal. We shall be glad to furnish you with further particulars and we solicit your inquiry.

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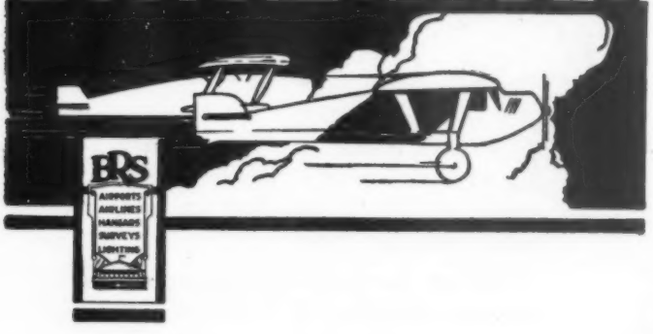
THE BEETLE

AIRPORTS



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taxi service, it is recommended that an additional charge of five dollars an hour be made."

The flying course, offered members attached to the first of the clubs to be established, it is planned will consist of 20 hr. instruction and 10 hr. solo time. The charge will be $550. This is based on the figures evolved by the transport engineering company. The instruction, which requires a pilot, is given at a rate of $20 an hour, while the solo time costs but $15 an hour.

The formation of other individual flying clubs is discussed in the brochure issued by the national organization. Concering this, the booklet says:

"Flying clubs may be organized in any city with a population of 100,000 or over. The procedure involves the application to the National Board of Governors by 10 representative citizens of unquestioned social and business standing. Their names must be acceptable to the National Admissions Committee, and their application must be passed upon by the National Advisory Committee.

"The 10 applicants will comprise a temporary Board of Managers for the flying club. They will set up temporary committees, and under a budgeted financial program, compiled and approved by engineers for the club, will proceed with the enrollment of members. The National Organization Committee will conduct a membership drive for the local Board of Managers, and will undertake the enrollment of members.

"After 50 per cent. of the membership necessary for financing the club has been secured, a meeting of the members is called. The permanent Board of Managers, officers, and committees are then elected and appointed, the property for the club is selected, and the improvement program is undertaken. The management of the individual flying club, consistent with the constitution, is vested in the Board of Managers."

The organization of the individual clubs in the various parts of the country undoubtedly will have a far reaching effect in increasing interest in aviation as a sport.

The Control of the Materials

(*Continued from page* 1185)

The designation of sizes under this plan calls for a further number, the significance of which will depend entirely on the kind of article it refers to. The application of size-number to all probable bolts and screws will be quite different from their application to cover sheet and strip steel of all widths and gauges, or pipe and fittings of all types and sizes. However, the application of numbers for this purpose has been worked out for all the usual classes of material, and is embodied in a set of tables, such that all the numbers lie in the series from 1 to 999 with none larger. Space precludes showing the whole of even one of these tables here, but a small portion of the Bolt and Screw Table is reproduced below.

STORES NUMBERS FOR BOLTS, SCREWS, PINS, RIVETS, ETC.

Mach. Scw. Sizes....		.137	.163	.189	.216	.242	.268	.295	.32	.374	
Mach. Scw. Numbers..		6	8	10	12	14	16	18	20	24	
Bolt Sizes.....		1/4		3/16		1/4		5/16		3/8	7/16
Lengths	1 13/16.....	89	129	169	225	281	350	419	489	563	619
	1 7/8.....	90	130	170	226	282	351	420	490	564	620
	1 15/16.....	91	131	171	227	283	352	421	491	565	621
	2.....	92	132	172	228	284	353	422	492	566	622
	2 1/8.....	93	133	173	229	285	354	423	493	567	623
	2 1/4.....	94	134	174	230	286	355	424	494	568	624
	2 3/8.....	95	135	175	231	287	356	425	495	569	625

From such a table it is found that the number representing size $\frac{5}{16}$x2 in. is No. 422. Then the full designation of the bolt in question is "13 HS 23—422."

(*Continued on page* 1224)

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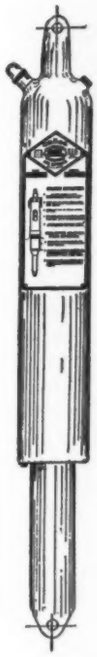
Shock Absorbers



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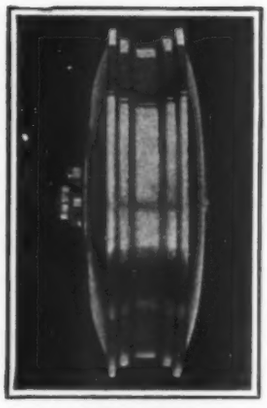

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THE actual structural strength of these wheels is far in excess of the requirements of the official hand books or of the ability of the tires used to stand, thus increasing the FACTOR OF SAFETY at a vital point. This with decreased weight.

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Refill Liquid, One Quart, now	1.80
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Quart size, now	9.00

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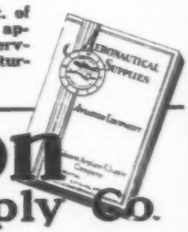

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There is no usual kind or size of open material, which cannot be given its own definite symbol on this plan. The great advantage of these symbols lies in their briefness and their absolute certainty. Stock room bins must carry labels showing the stock numbers of materials therein. Material specifications must give the stock numbers of materials called for. A blue print of the specification, being used as a material requisition (as described in an earlier article), the identification is complete. An illustration of the use of stock numbers constructed on this plan was shown in the reproduction of a specification, which appeared in two earlier numbers of this series, being those symbols under the heading "Stores Class and Number."

Method for Locating Items Important

We have now considered the means of identifying all items of standard stores. A question of importance, only secondary to that, is the means of locating them in the storeroom. It is not often practicable to arrange them in their bins in strict stock number order. Of course, all bolts will generally be near together, with all screws very likely close by, but the majority of articles must be placed according to size, weight, and convenience of handling, rather than according to stock number. Often, too, a small working stock of a given article will be in a convenient bin, while a larger reserve stock in bulk, will be carried in a warehouse at a more remote point. Or sometimes there may be two working stocks of the same thing in two departmental storerooms.

For any and all of these reasons there should be a card index of stock, arranged by stock numbers, and showing the locations where all items are to be found. The stock bins must therefore be marked according to their location. A plan which has worked well is illustrated in the drawing. Each section is numbered, each bay is lettered, and each shelf is numbered, from the floor up. One bin number then may be 3C5. This is marked on the location index card of the article in question.

While storekeepers soon learn the locations of most of their materials and seldom have need to consult the index, there are nearly always many little used items whose locations are forgotten. Sometimes they are quite lost, or covered up, and unless located, have to be re-purchased to meet a sudden need, although they are in the storeroom all the time.

The location index is indispensable in large storerooms and is very desirable in all.

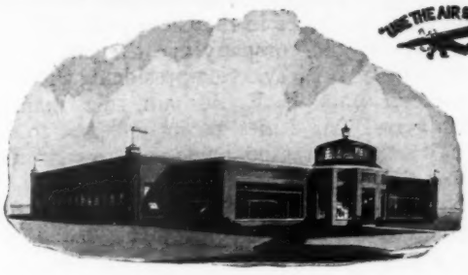
In the next article, which will appear in an early issue, Mr. Douglas considers the forms and uses of the stock ledger, and goes on from that to the subject of purchasing.

The Cleveland Airport

(*Continued from page* 1183)

similar flights. For cross-country service, the rates are: Stinson cabin planes, 50 cents per mile; Laird open-cockpit, 40 cents; Curtis OX-5 powered planes, 30 cents.

The Stewart Aircraft Co. is one of the newer organizations operating from the Cleveland Airport. It began operation on June 1. Complete new equipment has been provided. Since it began operation, the Stewart Co. has successfully made numerous long passenger flights to New York, Chicago, Detroit, Boston and other large cities. For most of thees trips, Stinson-Detroiter planes are being used. Travel Air machines are being flown also. The aviation school recently opened by the company al-



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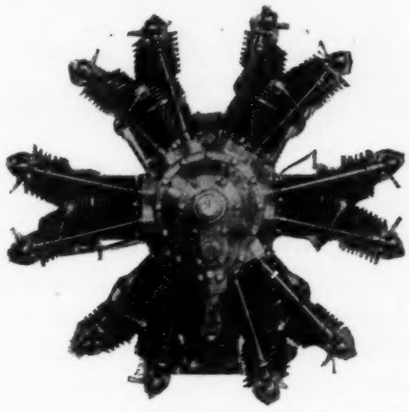

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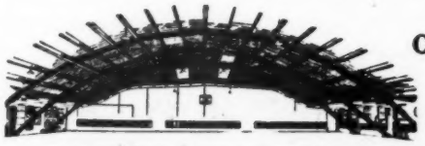

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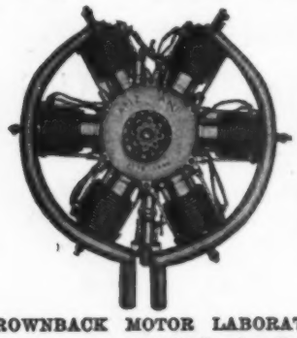

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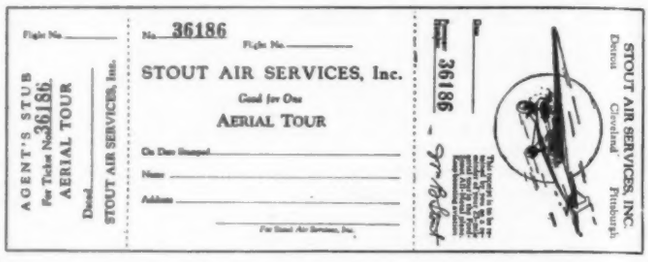
The officers of the company are Stewart V. Kramer, president; Otto I. Liesy, vice-president; Theodore E. Griffin, secretary, and E. E. Basham, sales manager.

The Universal Air Lines recently began to move its equipment to the Cleveland field, and regular flight service is now being conducted.

No passengers are carried by the two lines of the National Air Transport, operating through the Cleveland airport. The carrying of air mail is their chief activity.



A reproduction of a ticket for one of the aerial tours conducted by Stout Air Services, Inc., from the Cleveland terminal.

Two hangars are maintained, one of which supports on its roof a part of the field lighting equipment. The Cleveland airport is a stop on the National Air Transport's trans-continental air mail line, and on the night Chicago line.

The presence of a large number of competing companies at the Cleveland Airport is one reason for the all around high standard of efficiency, that has been recorded in the past. A large proportion of the flying equipment is new, but all of it is well kept up. Flying rates are much lower than those at smaller fields, where competition is not so keen.

The Cleveland Airport is operated by the city of Cleveland, as a strictly municipal project. A large area of level ground nearby has been acquired in anticipation of future

Thompson Aeronautical Corp. hangar at the Cleveland Municipal Airport.

growth. At present there, is ample space available for the hangars and equipment for a great many private concerns.

A few air line distances from Cleveland to other cities are as follows: Toledo, 92 mi.; Columbus, 132; Dayton, 172; Erie, 98; New York, 399; Cincinnati, 194; Grand Rapids, 270; Pittsburgh, 125; Louisville, 315; Syracuse, 328; Detroit, 127; Youngstown, 65; Buffalo, 183; Chicago, 324; Wheeling, 112; Akron, 30; Battle Creek, 225; Indianapolis, 270; Milwaukee, 398; Ithaca, 293, and Rochester, 233.

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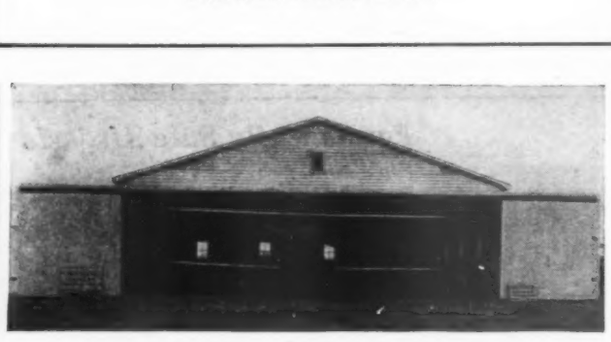

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SIDE SLIPS

By ROBERT R. OSBORN

Mr. R. H. D., Jr., who has just returned from having flown a ship out to the races in Los Angeles, brings a couple of wild tales with him. He said he was having some trouble along the way with his aircooled motor and finally at Tucson, Arizona, it wouldn't start at all. After working three or four hours in the desert sun, which at midday might register 120 or 130 degrees, in an attempt to find the trouble, a local pilot finally solved the difficulty by explaining that they always had to cool their motors off with a gasoline blow torch before trying to start them. Then, later, they found they couldn't climb enough to get over the mountains at all, until the ship had been flown back to the last field, so that he and his two passengers could change all of their accumulated silver dollars into paper bills.

We saw the starts of the Trans-Continental races last year from Roosevelt Field, and had hoped to see them again this year, chiefly because we must have missed nearly everything that was going on the first time. At least we were looking the other way when most of the items described in the following Chicago "Tribune" article were pulled off. Mr. R. J. B. of West Lafayette, Ind., sent us the clipping at the time for interpretation—

"The first plane, a Buhl Airster, took off at 7 o'clock, its powerful 220 horsepower Wright Whirlwind pounding a tocsin of time annihilating emprise. It was exactly 7:15 when the last plane, a Waco powered by the same Wright Whirlwind, kicked itself free and ascended the same aerial path. Each plane had received one minute headway after the first. Not a single untoward incident had interrupted the one minute intervals of the crescendo of the starting motors. The red flag of the official starter, Captain Walter Bender, fell as rhythmically as yesterday when the twenty-five planes, all class B entries, shot off in perfect rotation."

Mr. H. W. B. of Chicago sends in the following clipping taken from the story of an airplane accident in "The World's Greatest Newspaper":

"He flew it for ten minutes. Underneath he saw a green pasture, a stretch of farm land. Pulling back on the 'stick' he swooped down over the field, and then, without warning, the roar died. The plane was falling, the air shrieking past the struts."

Now in our country, when one pulls back on the stick and swoops down, he takes that to be plenty of warning of what is about to take place.

Mr. "Acon" of New York sends in this note showing how completely air-minded the younger generation is getting to be:

"Was at the field a short time ago, and while there I noticed two young boys very carefully studying an airplane. 'Ah,' I thought, 'these boys are fully airminded,—they have already learned to know planes forward and backward. They have taken aviation for granted and have with their youthful eagerness, mastered its principles.' I paused to listen to their discussion. . . . 'Say Bill,' said the first, indicating one of the ailerons. 'Lookit here—this wing is busted in the back.'"

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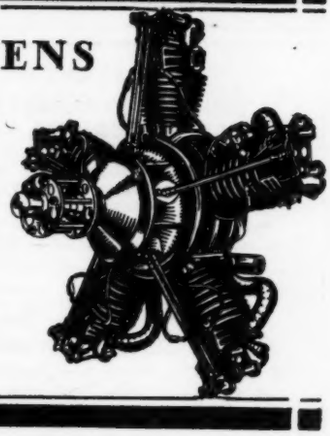

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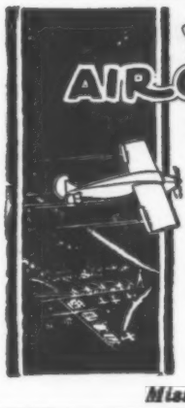

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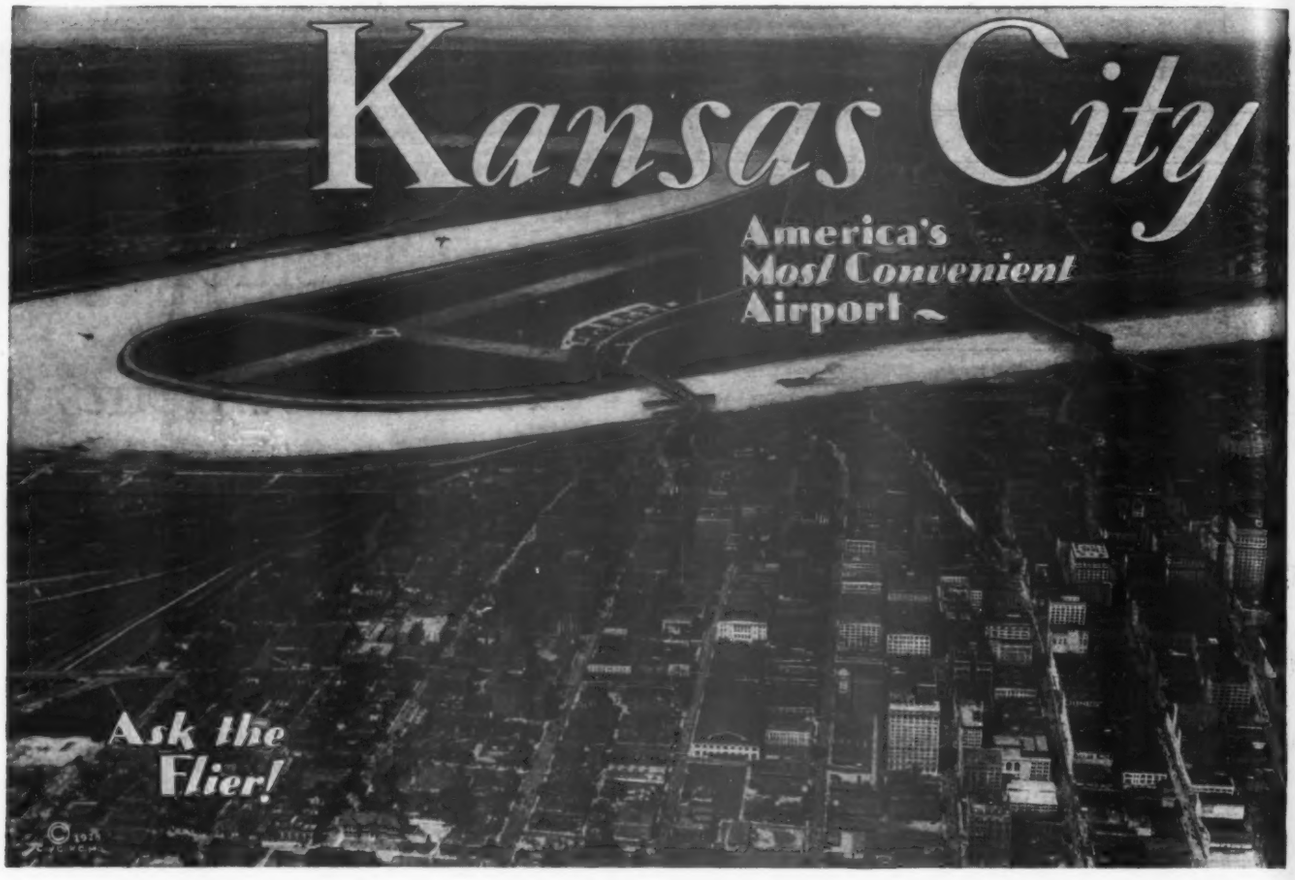

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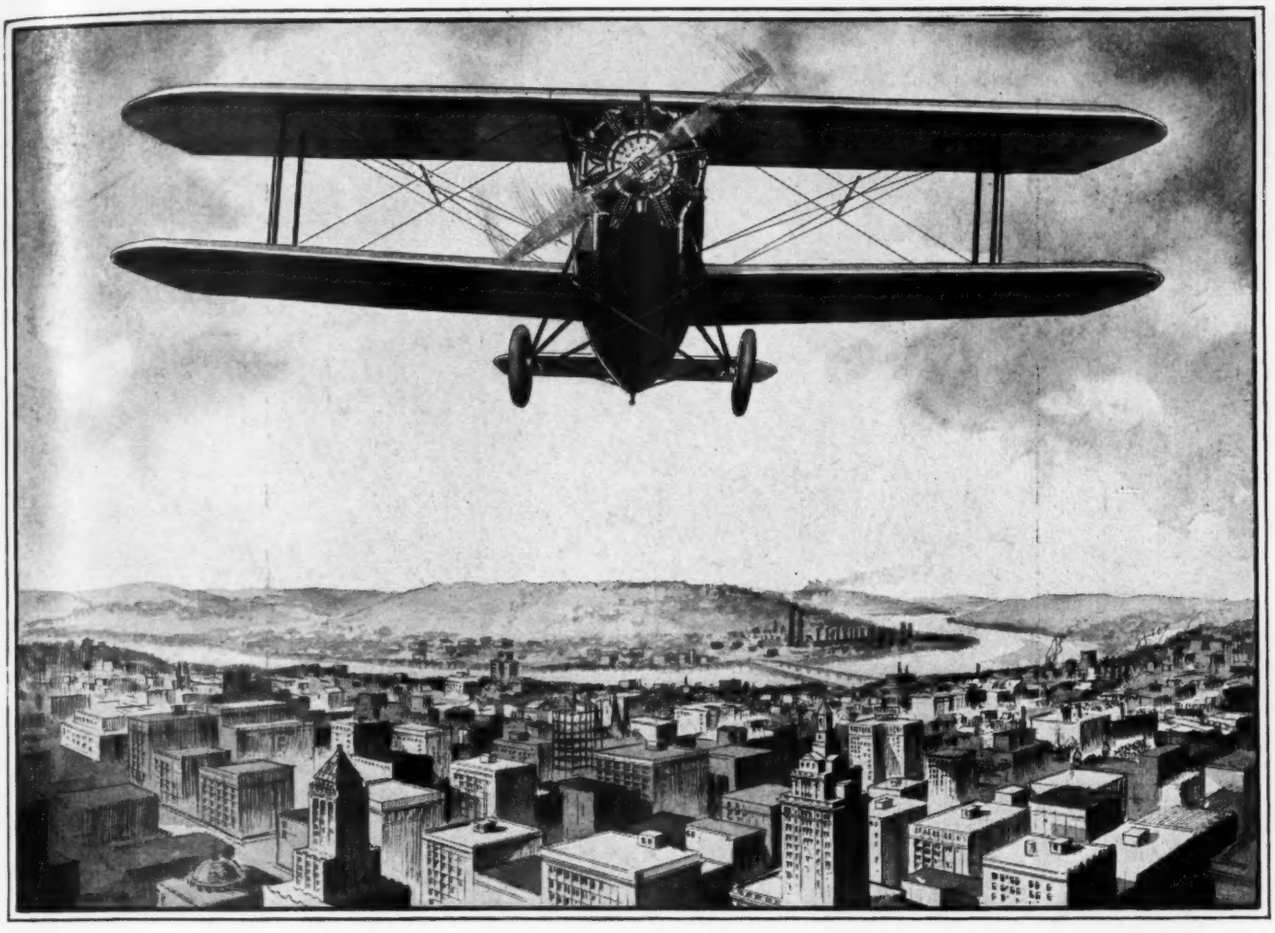

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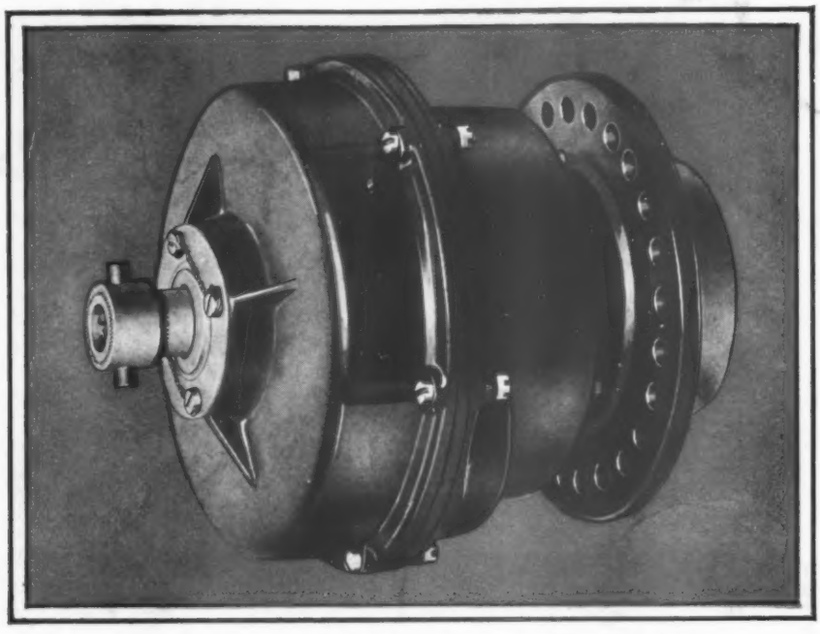

Particularly adapted for radial engines up to 1000 cubic inches

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